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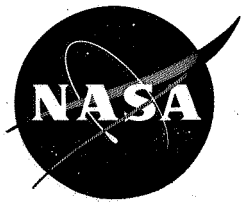

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TM-542
December 30, 1967

OPERATIONS AND MAINTENANCE MANUAL UPRATED SATURN I AND SATURN V VEHICLE STAGE PRESSURIZED LIGHTING SYSTEM

ELECTRICAL GUIDANCE AND CONTROL SYSTEMS DIVISION

KSC FORM 16-12 (4/66)

JOHN F. KENNEDY SPACE CENTER, NASA

TM-542

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ELECTRICAL GUIDANCE AND CONTROL
SYSTEMS DIVISION

December 30, 1967

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SECTION I
DESCRIPTION

1.1 PURPOSE

This manual provides the information necessary to operate, install, adjust, and troubleshoot the Vehicle Stage Pressurized Lighting System (Figure 1-1) in the field. This system shall be referred to herein as the Safety Lighting System.

1.2 SCOPE

This manual explains the function and operation of the Safety Lighting System. The detailed theory of operation and installation, adjustment, and troubleshooting procedures are also included. A complete set of drawings and diagrams is presented in Section VI of this manual.

1.3 APPLICABLE DOCUMENTS

KMI 1710.1.5 and SP-80-D.

1.4 OVERALL DESCRIPTION

1.4.1 GENERAL. The Safety Lighting System has been designed to provide safety lights for use in hazardous as well as in nonhazardous areas of the vehicle. Through use of the control box, the GN_2 pressure being applied to the tube lights from outside the vehicle can be indicated and controlled. In addition, the control box provides 115-vac, 60-Hz power to the system.

1.4.2 CONTROL BOX. The control box (Figure 1-2) contains the controls and indicators necessary to the operation of the Safety Lighting System. Included in the front of the control box are quick-disconnect fittings to facilitate installation and removal of GN_2 hoses; 115-vac, 60-Hz input and output power connectors; a 0-25 psi pressure regulator for controlling the amount of GN_2 for tube light purging operations; a pressure gage for monitoring GN_2 pressure; inlet and outlet GN_2 valves; and a vent valve for venting the control box during operation. In the rear of the control box (Figure 1-3) are located the internal electrical wiring, the GN_2 lines, the pressure switch, and the 0 to 100 psi pressure regulator.

1.4.3 TUBE LIGHT ASSEMBLY. The tube light assembly (Figure 1-4) consists of a 20-watt fluorescent lamp, a 20-watt ballast, a 20-watt fluorescent starter, a 1/2-amp slow-blow fuse, a lanyard assembly, a radio frequency interference (RFI) shield, two end-cap assemblies, a chassis assembly, and two electrical connectors. As noted, the tube lights are designed to be used in either nonhazardous or hazardous areas of the vehicle stages. When the tube lights are used in a hazardous area, a threaded

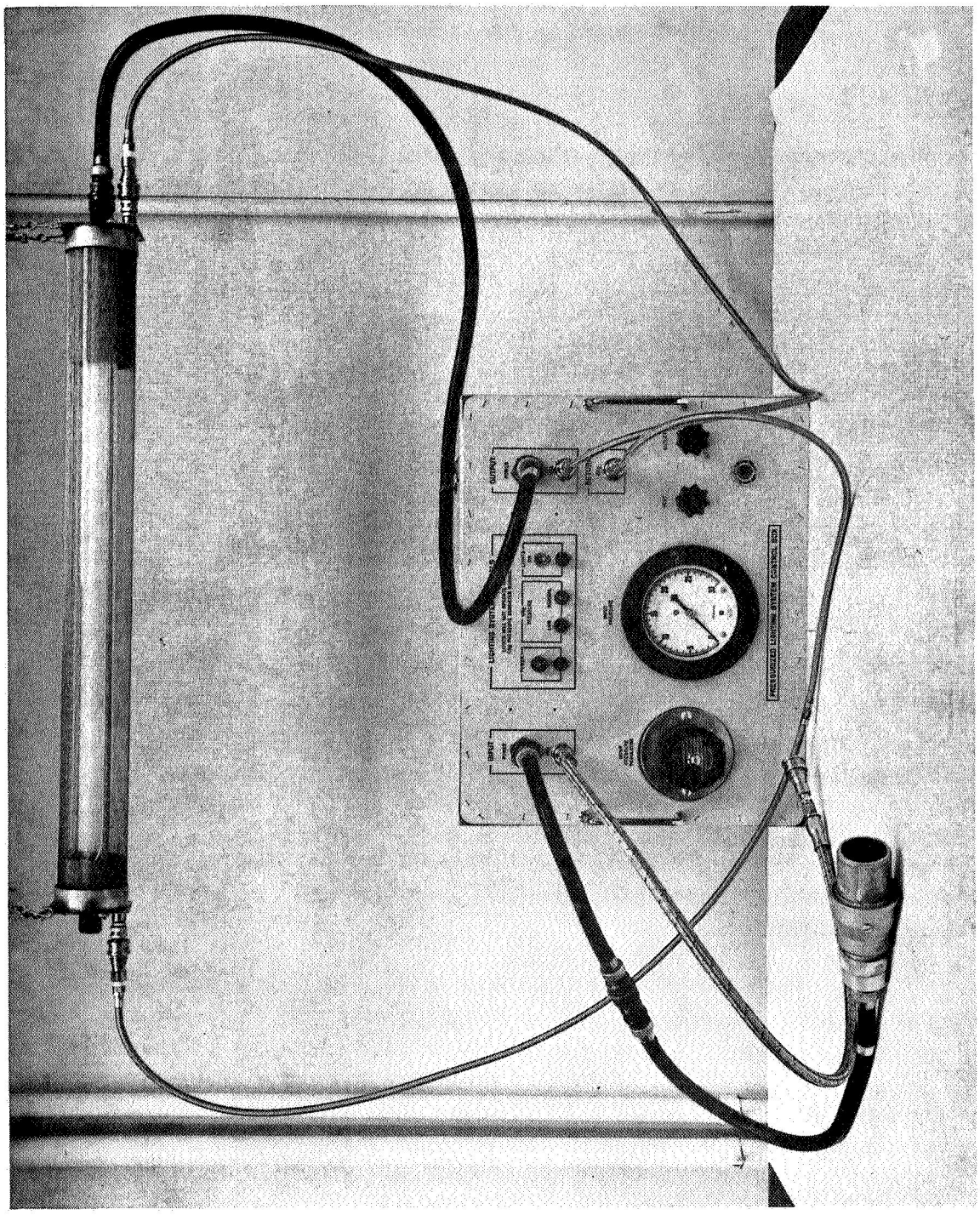


Figure 1-1. Vehicle Stage Pressurized Lighting System

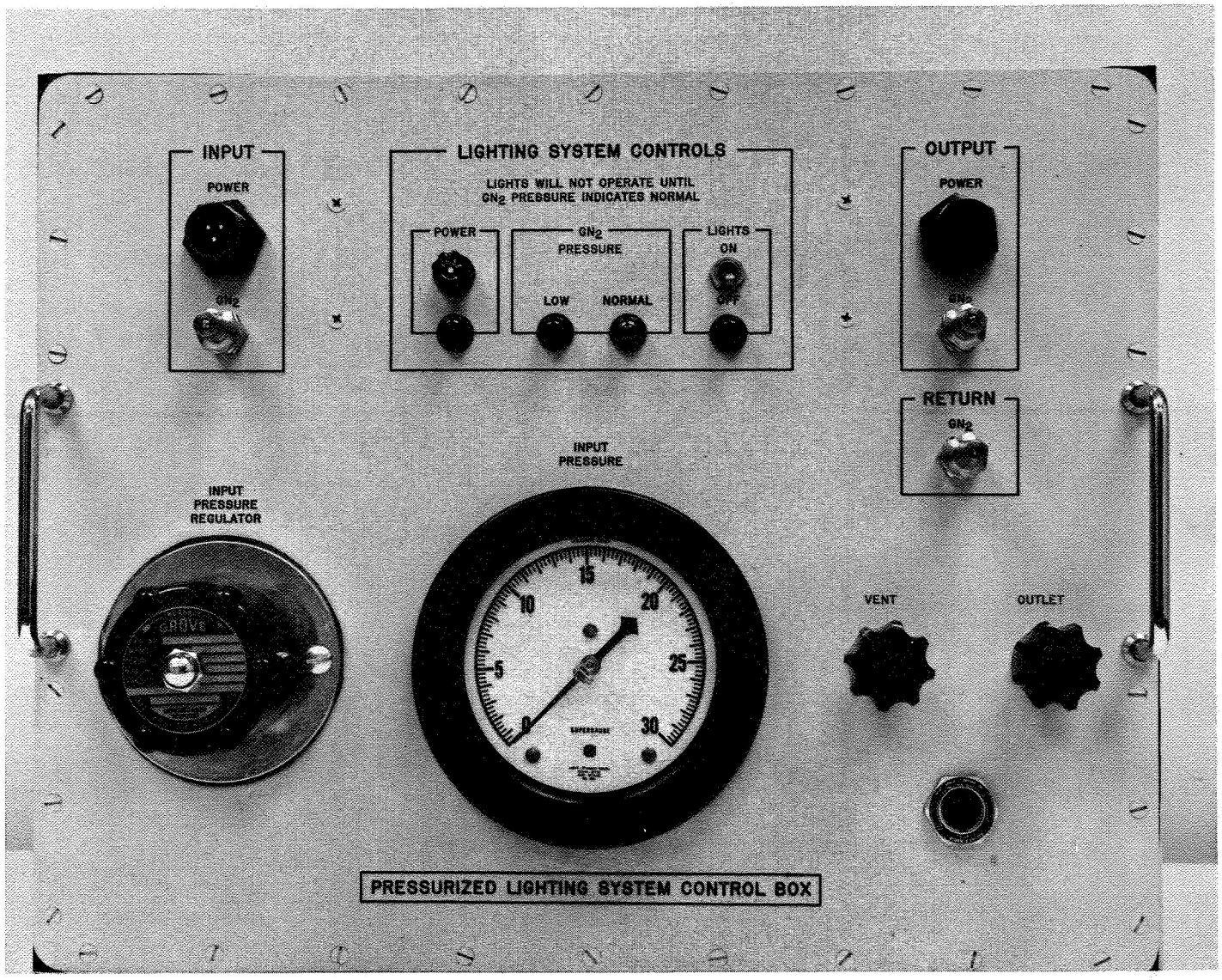


Figure 1-2. Control Box, Front View

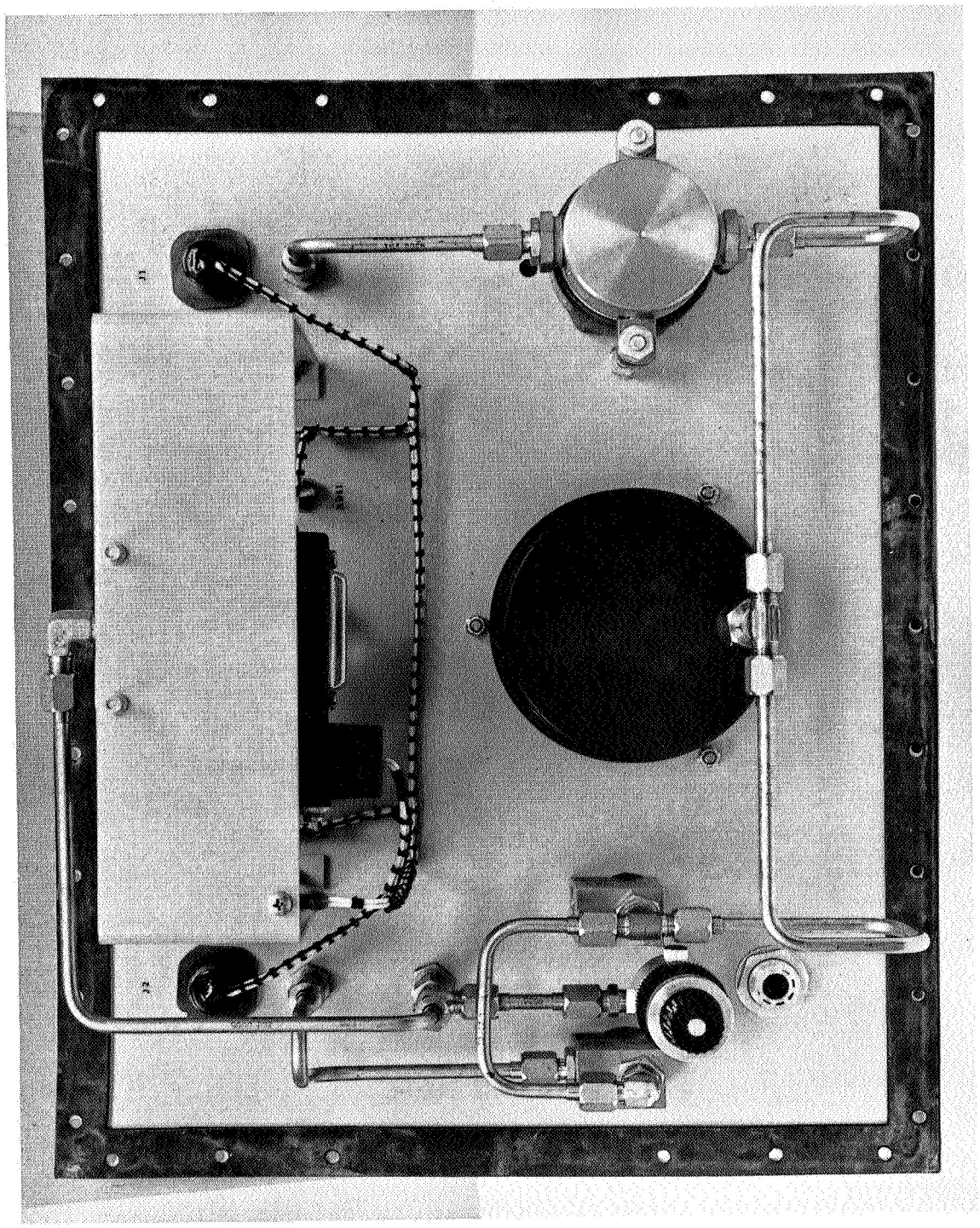


Figure 1-3. Control Box, Rear View

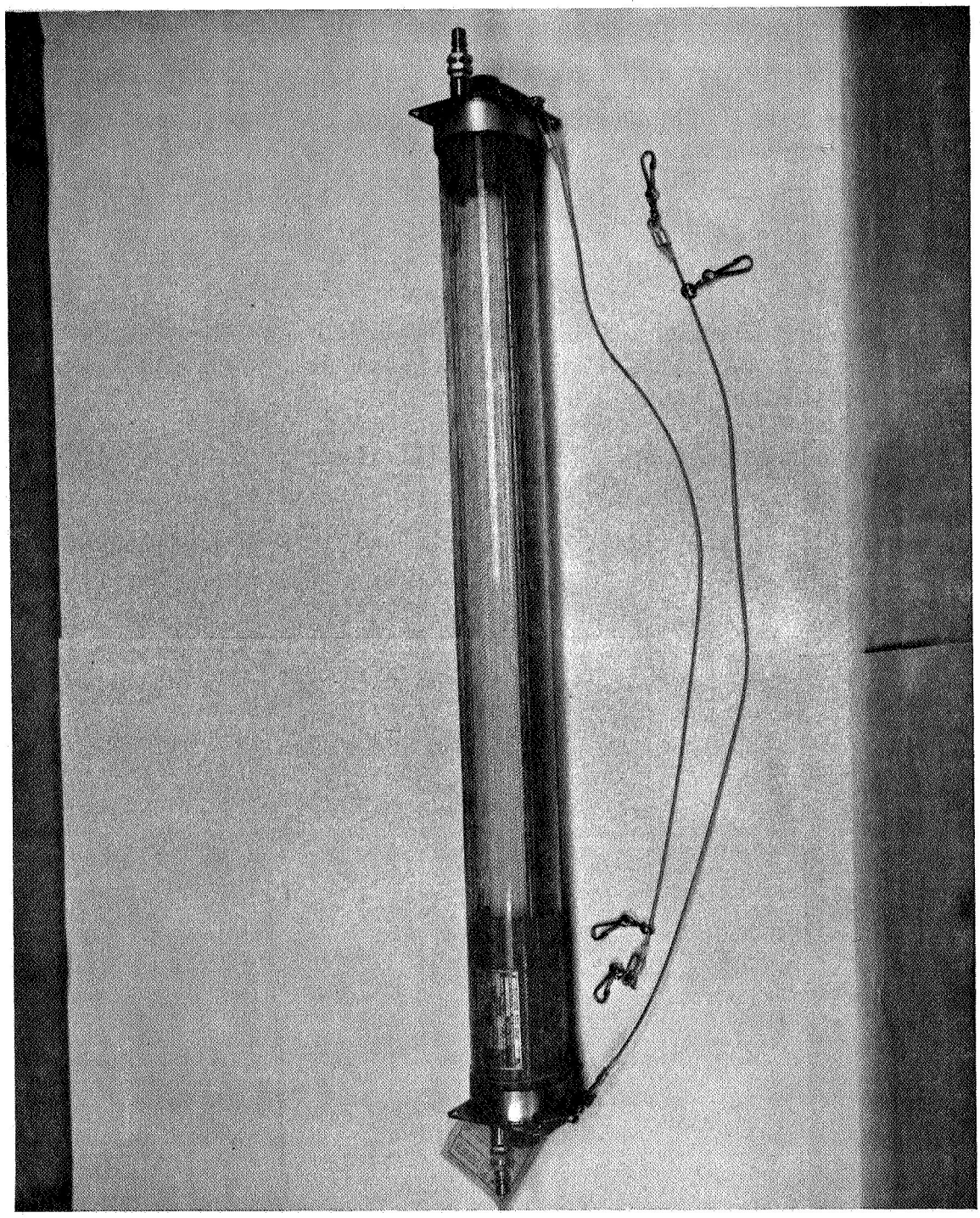


Figure 1-4. Tube Light Assembly

boss is welded to each end-cap assembly to connect GN_2 hoses between the tube lights. The GN_2 provides positive purging pressure through the entire system, thus eliminating any explosion hazards, and the RFI shield supresses the radio frequencies generated by the fluorescent tube lights. (The RFI shield precludes the possibility of the RFI being great enough to interfere with electronic equipment in the area.)

1.4.4 RFI-SHIELDED CABLES. The 115-vac, 60-Hz, shielded power cables (Figure 1-5) used in the vehicle for interconnecting purposes contain three-pin connectors, three-conductor No. 12 AWG, polyvinylchloride-insulated wire, and flexible RFI shields capable of 100 dB attenuation to broadband and pulsed CW radiated interference of 0.1 MHz to 1,000 MHz.

1.5 FUNCTIONAL DESCRIPTION

After approximately 5 minutes of GN_2 purging at 7 psi pressure, 115-vac, 60-Hz power is applied to the Safety Lighting System through the control box. The GN_2 provides constant purging throughout the entire system by means of flexible hoses connected between the control box and each of the tube lights. The 115-vac, 60-Hz power is applied through the control box to the heating elements, ballast, and starter in the tube light assembly to operate the lights. The tube light assemblies contain parallel current paths so that if any one of the lights becomes inoperative, the rest of the lights will continue to operate.

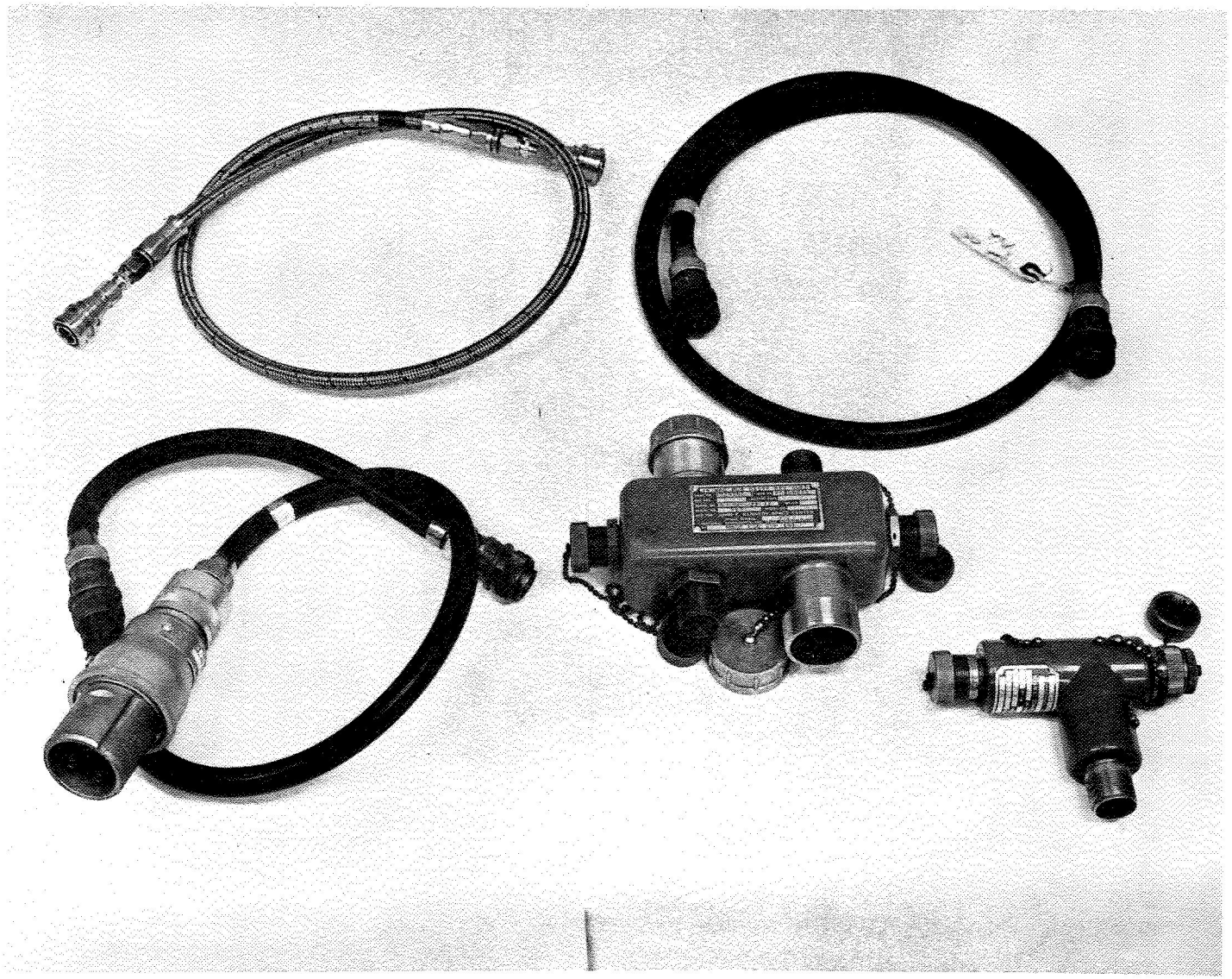


Figure 1-5. Power Cables and GN_2 Hoses

SECTION II
THEORY OF OPERATION

2.1 PNEUMATIC

When the system is connected pneumatically from the source, GN_2 enters the control box at the quick-disconnect fitting marked INPUT GN_2 (Figure 6-1). The GN_2 travels through the tubing, located in the rear of the control box control panel, to the INPUT PRESSURE REGULATOR, through the INPUT PRESSURE gage, through the OUTLET valve to the OUTPUT fitting. The GN_2 leaves the control box through the OUTPUT GN_2 quick-disconnect connector, and goes through the hoses to the tube lights, and then back to the control box through the quick-disconnect fitting marked GN_2 RETURN. The GN_2 then travels through the 0-100 psi pressure regulator (which is set at 3 psi to continually purge the control box) and terminates at pressure switch S1 (which has been set to actuate at 3 psi).

2.2 ELECTRICAL

The 115-vac, 60-Hz power is applied to the control box through INPUT POWER connector J1 by means of a power cable. The power is then routed from J1-A through the 8-amp LIGHTING SYSTEM CONTROLS POWER fuse F1 and POWER indicator DS1, to pressure switch S1. When no GN_2 has been applied to the system, the 115-vac, 60-Hz power is routed to the DS2 LOW PRESSURE indicator. The indicator will light, indicating that power, but no GN_2, is being applied to the control box. When GN_2 is applied to the system, pressure switch S1 closes, and power is applied to the DS3 NORMAL PRESSURE indicator. The indicator will light when the GN_2 pressure is adequate. When LIGHTING SYSTEM CONTROLS LIGHTS ON/OFF switch S2 is on, 115-vac, 60-Hz power is applied to the DS4 LIGHTS ON indicator and to the OUTPUT POWER connector J2-A. (The indicator will light when the tube lights are lighted.) The power is picked up at the OUTPUT POWER connector and routed through the tube lights with a return path to J1-B and J2-B. The 115-vac, 60-Hz power enters the first tube light through POWER INPUT connector J1. The tube lights are grounded through the tube light rods and cables to J1-C. A parallel power path to all lights is available through J1-A and J1-B. The power is picked up at J1-A and is routed through 1/2-amp slow-blow fuse F1, ballast L1, the starter, and the tube light heater elements to the neutral line at J2-B and back to the control box at POWER OUTPUT J2-B.

SECTION III
OPERATION

3.1 GENERAL

There are two safety lighting systems that may be used in the vehicle. These two systems are called "purge" and "nonpurge." The nonpurge system is used only in nonhazardous areas (areas where there is no possibility of an explosion). With this system, GN_2 purging is not required, and the lights are connected directly to the 115-vac, 60-Hz power source.

In the purge system the lights are constantly purged with GN_2 while the system is operating. A threaded boss is welded to each of the two end-cap assemblies on the tube light in accordance with the information contained in sheet 5 of Figure 6-1. The procedures presented in this section are for the purge system.

3.2 LIGHTING SYSTEM INSTALLATION AND OPERATION

The following procedures cover the installation of both the control box and the tube lights with the interconnecting cabling.

WARNING

To prevent damage to equipment and/or serious injury or death to personnel, verify that pin A of the 115-vac, 60-Hz power source connector is line, pin B is neutral, and pin C is ground.

a. Check to ensure that the 115-vac, 60-Hz power source connector corresponds to INPUT POWER connector J1 (located on the control box) pin-for-pin.

b. Set up the control box outside of the vehicle.

NOTE

A maximum of 16 lights may be connected through the control box. The work area inside the vehicle will determine how many tube lights are needed and how the lights are to be installed.

c. Install the tube lights inside the vehicle. Do not connect the lights to the control box at this time.

NOTE

Safety wire all electrical connectors.

CAUTION

Verify that the power cables used inside the vehicle are RFI-shielded to preclude radio frequencies generated by the tube lights interfering with electronic equipment in the area.

d. Connect power calbes between the lights. Do not connect the power cables to the control box at this time.

e. Connect the GN_2 hoses between the lights.

f. Check the GN_2 supply source and ensure that the valve is in the OFF position.

g. Ensure that the LIGHTING SYSTEM CONTROLS LIGHTS ON/OFF switch on the control box is in the OFF position.

h. Ensure that the INPUT PRESSURE REGULATOR, the VENT valve, and the OUTLET valve are closed.

i. Connect the GN_2 supply line to the INPUT GN_2 fitting on the control box.

j. Connect a GN_2 hose between the first tube light in the vehicle and the OUTPUT GN_2 fitting on the control box.

k. Connect a GN_2 hose between the last tube light in the vehicle and the RETURN GN_2 fitting on the control box.

l. Disconnect the GN_2 hose connected in step k from the RETURN GN_2 fitting only.

WARNING

Inhaling GN_2 over a long period of time while working in a closely confined area may cause asphyxiation. Verify that there is no GN_2 leak prior to performing tube light installation procedures.

m. Turn on the GN_2 at the source.

n. Adjust INPUT PRESSURE REGULATOR to read 15 psi on the INPUT PRESSURE gage.

NOTE

A GN_2 detector may be used to ensure that GN_2 has replaced the air in the tube lights. Vent the GN_2 outside the vehicle.

o. Open the OUTLET valve on the control box for 5 minutes to ensure that the GN_2 replaces the air in the tube lights.

p. Reconnect the GN_2 hose from the last tube light to the RETURN GN_2 fitting on the control box while the system is still being purged.

q. Adjust the INPUT PRESSURE REGULATOR to read 7 psi on the INPUT PRESSURE gage. Allow the system to run for 5 minutes at this setting.

r. Ensure that the LIGHTING SYSTEM CONTROL LIGHTS ON/OFF switch on the control box is in the OFF position.

s. Connect a power cable between the 115-vac, 60-Hz power source and the INPUT power connector on the control box, and safety wire the two connectors together.

t. Check the LIGHTING SYSTEM CONTROLS POWER and GN_2 PRESSURE NORMAL indicators to ensure that they are lighted.

u. If the GN_2 PRESSURE NORMAL indicator on the control box is lighted, place the LIGHTING SYSTEM CONTROL LIGHTS ON/OFF switch to the ON position.

3.3 SHUTDOWN

The following procedures cover the removal of the control box and the tube lights with the associated power cables and GN_2 hoses.

a. Place the LIGHTING SYSTEM CONTROL LIGHTS ON/OFF switch to the OFF position.

b. Disconnect the 115-vac, 60-Hz power cable from the source.

c. Remove the safety wires from both the INPUT and OUTPUT POWER connectors on the control box, and disconnect the power cables.

d. Turn off the GN_2 at the source.

e. Disconnect the GN_2 hoses from the INPUT and OUTPUT GN_2 fittings on the control box.

f. Disconnect the GN_2 hose from the GN_2 RETURN fitting on the control box.

g. Close the OUTLET valve on the control box.

h. Open the VENT valve on the control box.

i. Disconnect the power cables between the tube lights.

j. Disconnect the GN_2 hoses between the tube lights.

k. Remove the tube lights from the vehicle.

SECTION IV
SPECIAL TOOLS AND EQUIPMENT

4.1 GENERAL

The following special tool and equipment (Figure 4-1) consisting of an RFI-shielded and molded distributor, and RFI-shielded tee adapter, and a torque wrench are used for installation and operation of the tube light assembly.

4.2 DISTRIBUTOR

WARNING

Do not use distributors in hazardous environments.

The distributor is an RFI-shielded, 115-vac, 60-Hz utility power distributor used for adding extra tube lights or other power equipment simultaneously with the tube lights. All six of the connectors on the distributor are molded with safety-orange colored, polyurethane potting material.

4.3 TEE ADAPTER

The tee adapter is an RFI-shielded, 115-vac, 60-Hz utility power adapter, providing versatility in the hookup of the tube lights inside the vehicle. All three of the connectors on the tee adapter are molded with safety-orange colored, polyurethane potting material.

4.4 TORQUE WRENCH

A 0-150 in./lb torque wrench with a 7/16-inch box-end ratchet is used to tighten nuts to the three rods on each tube light assembly. (The nuts are torqued to 45 in./lb.) The torque wrench shown in Figure 4-1 is typical. Any standard torque wrench with settings of from 0 to 150 in./lb may be used.

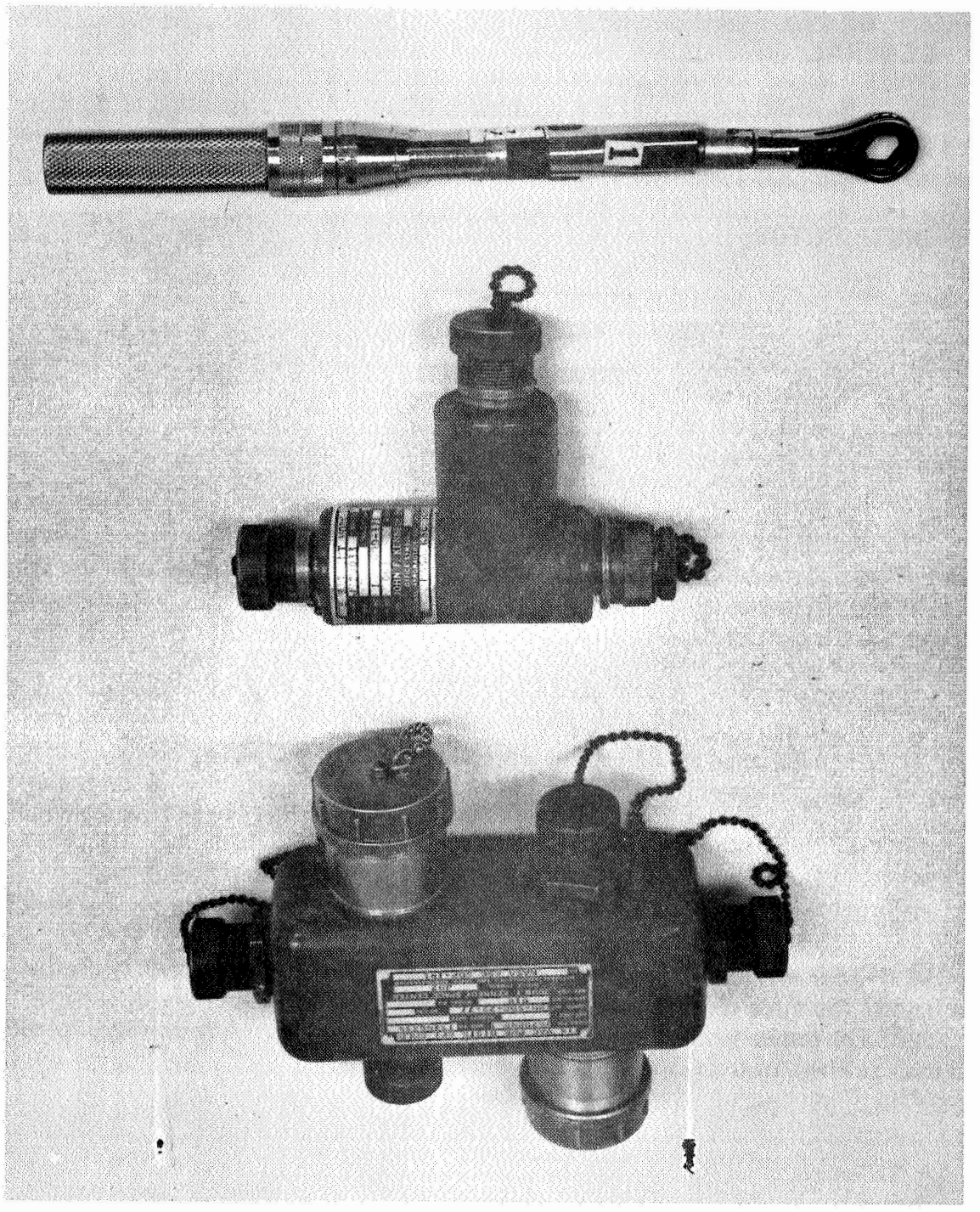


Figure 4-1. Distributor, Tee Adapter, and Torque Wrench

SECTION V
MAINTENANCE PROCEDURES

5.1 GENERAL

The following maintenance procedures consist of checks, adjustments, and troubleshooting of the control box and tube light assemblies. Disassembly is to be performed only to the extent necessary to remove and replace a defective component or part.

5.2 CHECKS AND ADJUSTMENTS

5.2.1 CHECKS

a. Ensure that the 0-100 psi internal pressure regulator in the control box has been set to 3 psi to purge the control box.

b. Check to ensure that there is a valid calibration sticker on the INPUT PRESSURE gage.

c. Check all components on the control box to ensure that they have been installed correctly and are tightened.

d. Check the tube lights to ensure that the RFI shields and end-cap assemblies have been installed correctly and that the lights are operating.

WARNING

Inhaling GN_2 may cause asphyxiation. Verify that there is no GN_2 leak prior to performing tube light installation procedures.

e. Check the GN_2 hoses and power cables used inside the vehicle to ensure that they have been installed properly between the tube lights and the control box.

f. Check that power cables used inside the vehicle are RFI shielded.

5.2.2 ADJUSTMENTS

The only adjustments are on the INPUT PRESSURE REGULATOR:

a. With GN_2 pressure being applied to the system, turn the INPUT PRESSURE REGULATOR handwheel clockwise to increase the pressure; or counterclockwise to decrease the pressure. Set the handwheel to the desired pressure (7 psi) as observed on the pressure gage.

b. Remove the capnut on the top of the handwheel, and turn the relief adjusting screw clockwise until a slight flow of GN_2 can be detected through the side slot in the spring barrel.

c. Turn the relief adjusting screw counterclockwise until the venting stops.

d. If the setting in step c does not restrict the flow of GN_2 completely, turn the relief adjusting screw further counterclockwise, but in no case more than four turns.

NOTE

The relief adjusting screw must be reset each time the handwheel setting is changed.

e. After setting the relief screw, check to see if it is necessary to adjust the handwheel for the desired outlet pressure. If a handwheel adjustment is necessary, reset the relief adjusting screw.

f. After satisfactory adjustments have been made, replace the capnut on the top of the handwheel.

5.3 TROUBLESHOOTING

The following procedures cover troubleshooting in the control box and tube light assemblies and the necessary corrective action.

a. NO TUBE LIGHTS WILL LIGHT. If the system is connected and the tube lights do not light, the GN_2 pressure has fallen below 7 psi or the power hookup is improper. Take corrective action as follows:

(1) Check the GN_2 source; if below the required 50 psi pressure, adjust the source pressure to read 50 psi on the source pressure gage.

(2) After turning off the GN_2, disconnect the GN_2 hose from the INPUT GN_2 fitting on the control box. Check the hose for damage or clogging. Clear

the hose with high-pressure air or replace it with a good hose. Reconnect the GN_2 hose to the control box and turn on the GN_2.

(3) Check the OUTLET valve on the control box. The valve should be opened. If not, open the valve.

(4) If the correct pressure can be read on the INPUT PRESSURE gage, but there is no pressure at the OUTLET valve, the GN_2 line between the INPUT PRESSURE gage and the OUTLET valve is clogged. If this is the case, proceed as follows:

(a) Shut down the system.

(b) Remove the front panel from the control box.

(c) Refer to the schematic in Figure 6-1, sheet 1, and remove the GN_2 line between the INPUT PRESSURE gage and the OUTLET valve.

(d) Clear the line, if clogged, with GN_2 or high-pressure air.

(e) Reinstall the GN_2 line between the INPUT PRESSURE gage and the OUTLET valve.

(f) Reinstall the front panel on the control box.

(5) The relief adjusting screw is set completely open, allowing all the GN_2 to vent into the control box. Refer to the pressure regulator adjustment procedures in paragraph 5.2.2.

(6) If after the foregoing procedures have been performed the problem still exists, shut down the system, remove all of the power cables, GN_2 hoses, and GN_2 lines behind the front panel of the control box. Refer to the electrical and pneumatic schematics for the system, purge the GN_2 lines and hoses, and check the power cables for faulty wiring or damaged connectors. Replace cables, GN_2 hoses, and GN_2 lines, if defective.

(7) Check the 115-vac, 60-Hz power source to verify that there is power available.

(8) Refer to the electrical schematic in Figure 6-1, sheet 1, and checkout the control box internal wiring and the 8-amp fuse F1. Replace blown fuse and/or defective wiring.

b. ONE TUBE LIGHT FAILS TO LIGHT. If all of the tube lights except one in the system are lighted, proceed as follows:

WARNING

Do not disconnect any electrical connectors or pheumatic connections under hazardous conditions.

(1) Shut down the system.

(2) Remove the inoperative tube light.

(3) Disassemble the tube light assembly as shown in Figure 5-1.

(4) Check the 1/2-amp slow-blow fuse F1, the ballast, the tube light starter, and the fluorescent light. Replace any defective components.

(5) Reassemble the tube light assembly, and before reinstalling the assembly in the system, verify that it is working correctly.

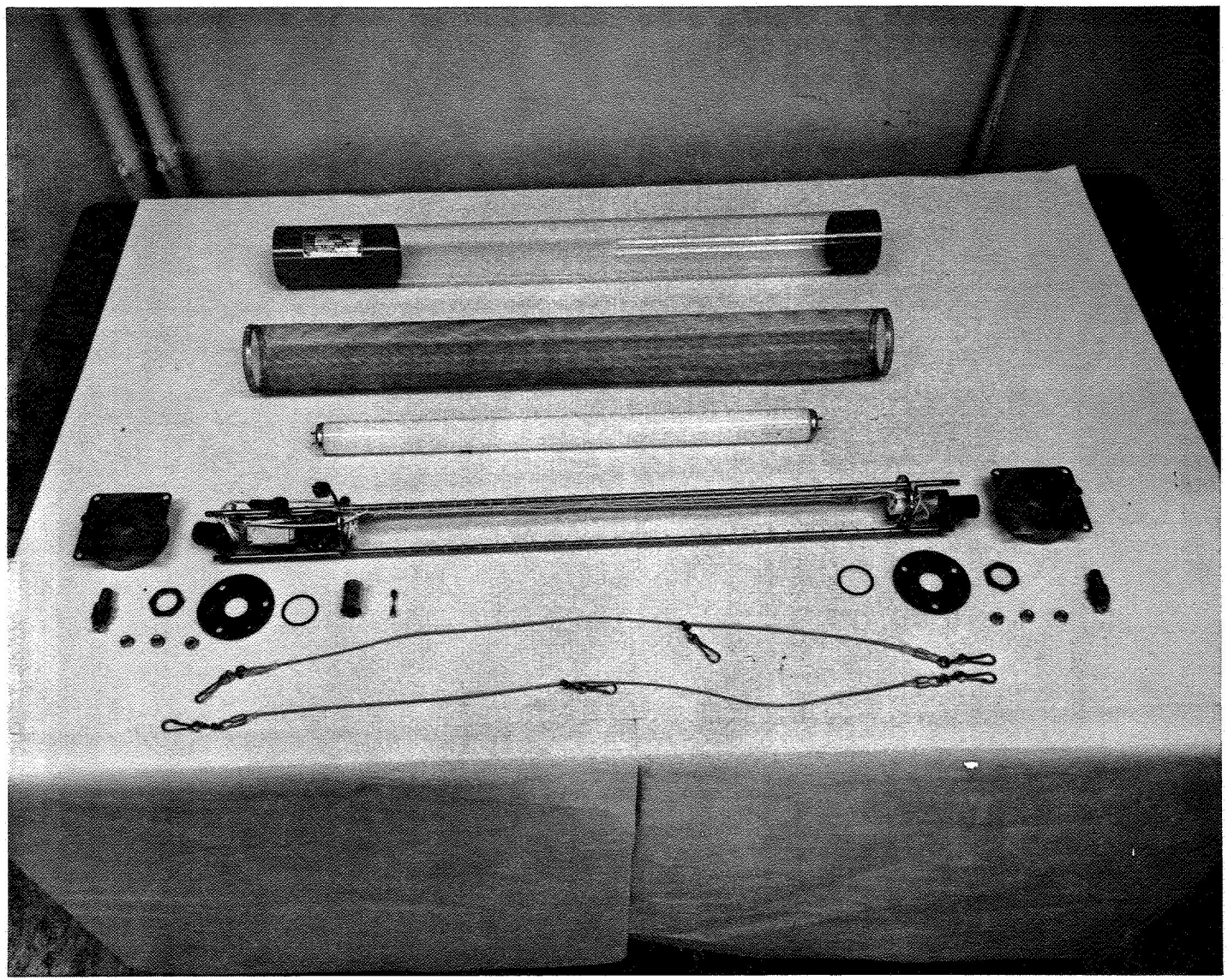


Figure 5-1. Disassembled Tube Light Assembly

SECTION VI
DIAGRAMS AND DRAWINGS

Figures 6-1 through 6-11 contain all of the diagrams, drawings, and parts list that make up the pressurized lighting system. Figures 6-5 and 6-6, respectively, contain the assembly drawings for the molded tee adapter and the molded distributor.

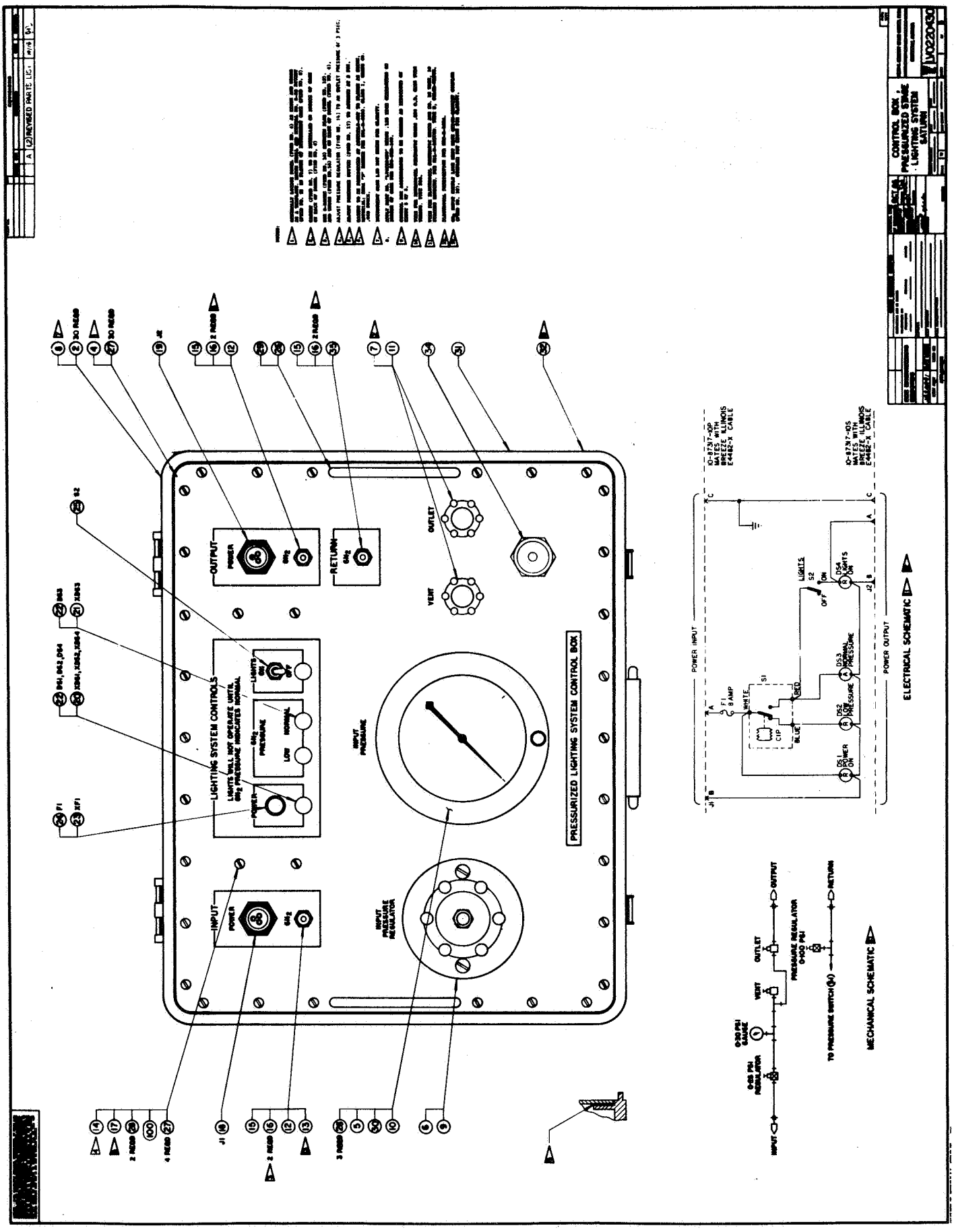


Figure 6-1. Control Box (Sheet 1 of 5)

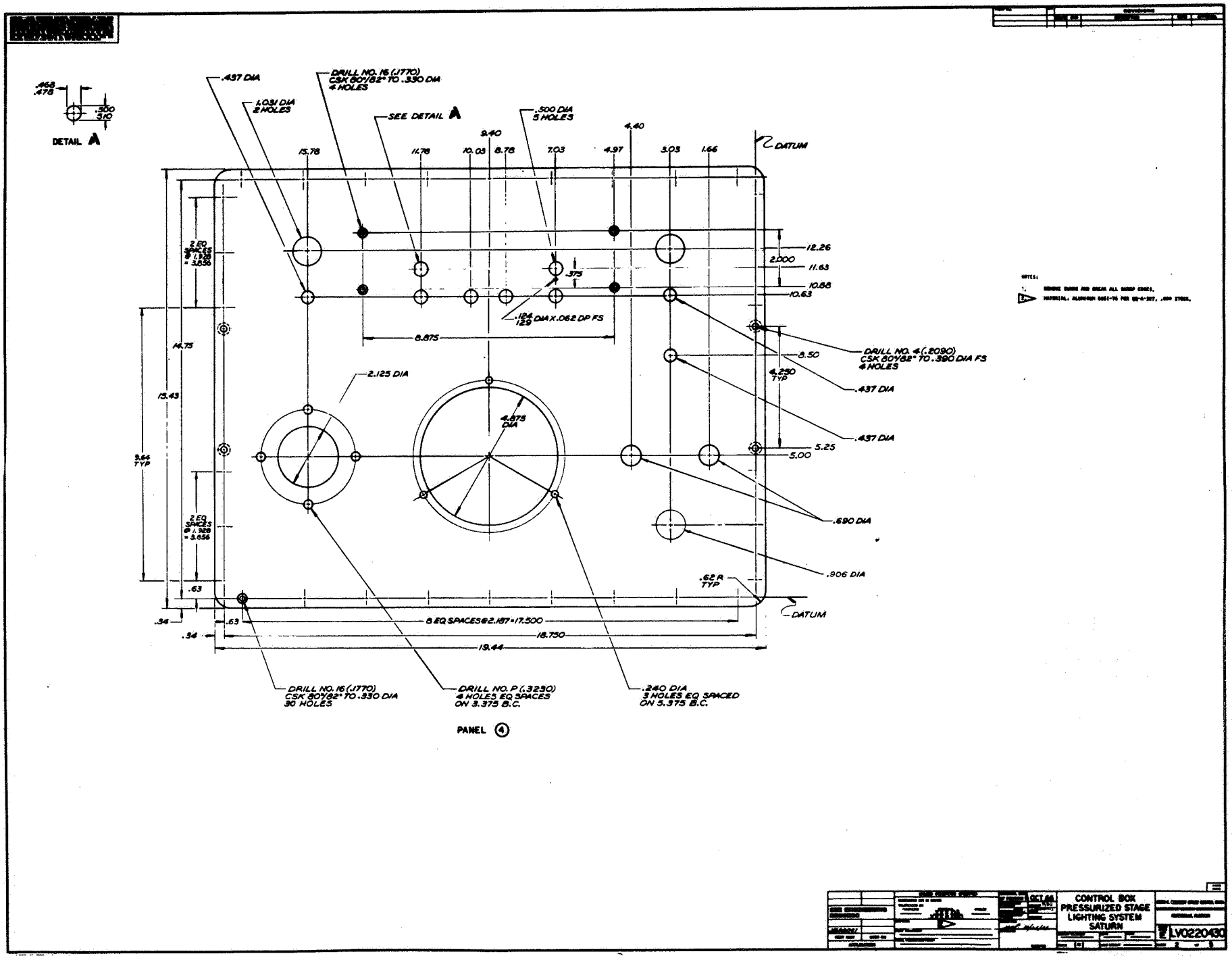
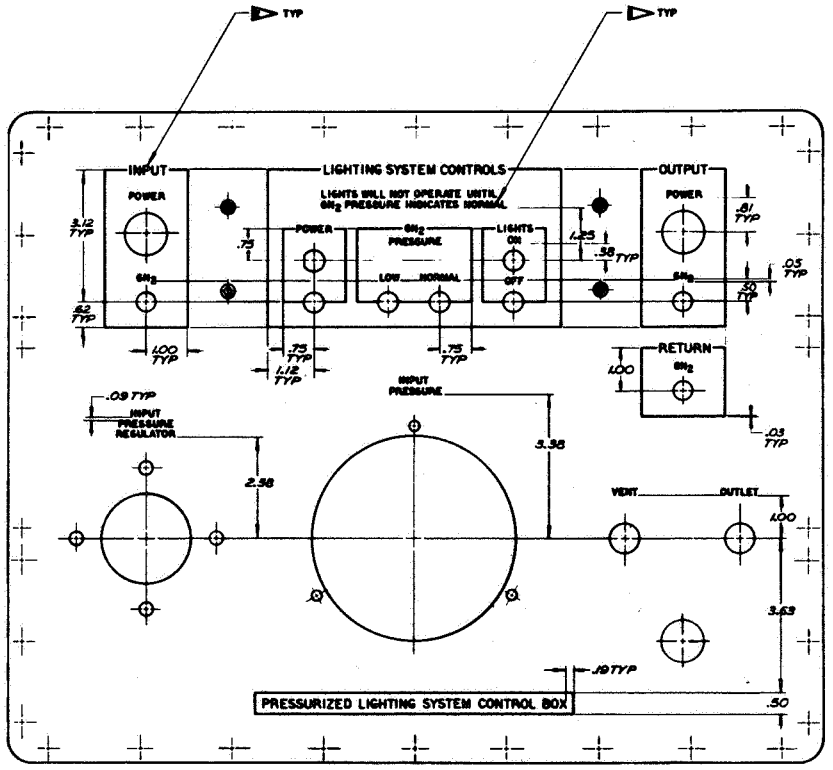


Figure 6-1. Control Box (Sheet 2 of 5)



ENGRAVING DETAIL OF FN (4)

NOTES:

3. ENGRAVE PER SPEC-STD-100 AA INDICATED LINING .125 HIGH CHARACTERS AND FILL WITH BLACK PAINT.
4. ENGRAVE PER SPEC-STD-100 AA INDICATED LINING .250 HIGH CHARACTERS AND FILL WITH BLACK PAINT.
5. AFTER ENGRAVING PAINT PER MSFC-PROC-DRAWING-1, USING COLOR (GRAY 26440) PER FED-STD-595.

CONTROL BOX PRESSURIZED STAGE LIGHTING SYSTEM SATURN

LV0220430

Figure 6-1. Control Box (Sheet 3 of 5)

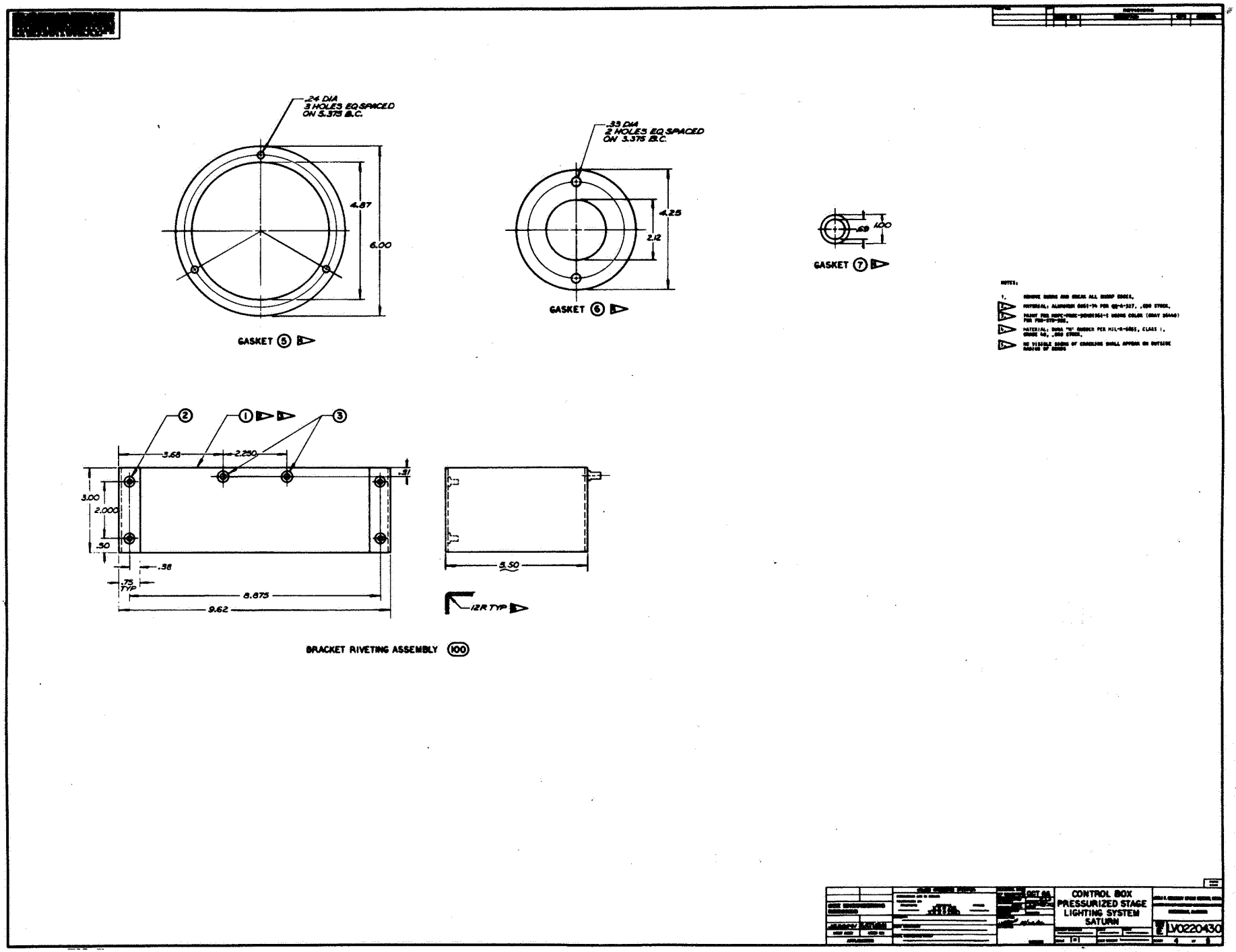


Figure 6-1. Control Box (Sheet 4 of 5)

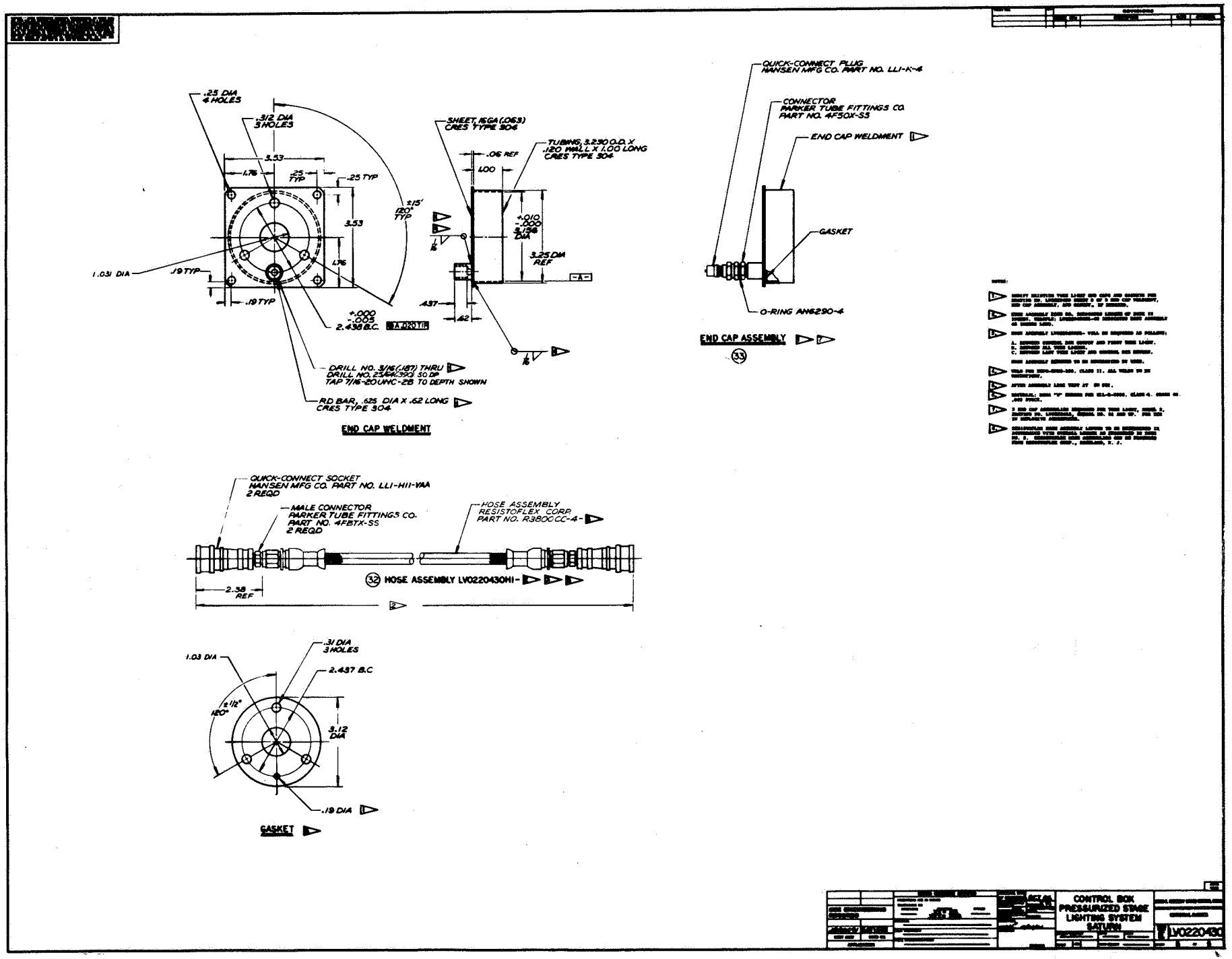


Figure 6-1. Control Box (Sheet 5 of 5)

PARTS LIST

SIZE ASSY DWG E | PL LVO220430

1 FIND ING NO.	2 DESCRIPTION	3 REF DESIG/FED ITEM IDENT NO.	4 DWG SIZE	5 PART/STK NO. DWG. NO.	6 MFRS. PART NO.	7 REQD	8 SEP PART LIST	9 REMARKS OR MFR.
100	BRACKET RIVETING ASSEMBLY		E	SHEET 4 OF LVO220430		REF		CONSISTS OF FN 1,2,3
1	BRACKET	PART OF FN 100	E	SHEET 4 OF LVO220430		1		
2	RIVNUT NO. 8-32	PART OF FN 100			A-8K-106	34		B.F.GOODRICH
3	RIVNUT NO. 10-32	PART OF FN 100			A-10K-116	2		B.F.GOODRICH
4	PANEL		E	SHEET 2 OF LVO220430		1		
5	GASKET		E	SHEET 4 OF LVO220430		1		
6	GASKET		E	SHEET 4 OF LVO220430		1		
7	GASKET		E	SHEET 4 OF LVO220430		2		
8	CASE, INSTRUMENT				SK689800	1		SKYDYNE INC.
9	REGULATOR, PRESSURE, 0-25 PSI				10927AA2A MODEL 15L	1		GROVE VALVE & REGULATOR
10	GAUGE, 0-30 PSI				8103 PER SPEC 65894	1		U.S. GAUGE
11	VALVE, ANGLE, SHUT OFF				30-1100-304	2		TESCOM CORP.

NOTES:

REVISIONS				NEXT ASSY	USED ON
SYM	DATE	APPR	DESCRIPTION		
A	10-18	[illegible]	(1) FIND NO. 14 PART NO. WAS R04-200-NNK-AU (2) FIND NO. 34 PART NO. WAS SK-M-846 SKYDYNE, INC.		

ORIG DATE 6 OCT 66
DFMN WAR CHK [illegible]
TYP SC ENG
SUBMITTED [illegible]
APPROVED

LIST OF PARTS FOR
CONTROL BOX
PRESSURIZED
STAGE
LIGHTING SYSTEM
SATURN

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
JOHN F. KENNEDY SPACE CENTER
KENNEDY SPACE CENTER, FLORIDA

SIZE ASSY DWG E | PL. LVO220430 | Sheet 1 of 4

KSC FORM 23-109NS (6/65) Print No.

Figure 6-2. Control Box Parts List (Sheet 1 of 4)

PARTS LIST

SIZE ASSY DWG E | PL LV0220430

1 FIND NO.	2 DESCRIPTION	3 REF DESIG/FED ITEM IDENT NO.	4 DWG SIZE	5 PART/STK NO. DWG. NO.	6 MFRS. PART NO.	7 REQD	8 SUP PART LIST	9 REMARKS OR MFR
12	PLUG, QUICK-CONNECT				LL1-K-4	2		HANSEN MFG. CO.
13	SOCKET, QUICK-CONNECT				LL1-H11-VAA	1		HANSEN MFG CO.
14	REGULATOR, 0-100 PSI 1/8 NPT				R04-100-NNK-AU	1		C.A. NORGREN CO. LITTLETON, COLO
15	UNION, BULKHEAD				4WBTX-SS	3		PARKER TUBE FITTINGS CO.
16	O-RING, AN6290-4				400-4	6		AIRWAY HYDRAULICS CO.
17	SWITCH, PRESSURE	(S1)			D1T-H18SS	1		BARKSDALE VALVE CO.
18	CONNECTOR	(J1)			10-87317-10P	1		BENDIX CORP.
19	CONNECTOR	(J2)			10-87317-10S	1		BENDIX CORP.
20	LIGHT, INDICATOR, RED	(DS1, DS2, DS4)			181-8864-0931-513	3		DIALIGHT CORP.
21	LIGHT, INDICATOR, AMBER	(XDS3)			181-8864-0933-513	1		DIALIGHT CORP.
22	LAMP, NEON, 110-125VAC	(DS1-DS4)			NE-2J	4		DIALIGHT CORP.
23	FUSE HOLDER	(XF1)			342004	1		LITTELFUSE CO.

NOTES:

REVISIONS				NEXT ASSY	USED ON
SYM	DATE	APPR	DESCRIPTION		

ORIG DATE 6 OCT 66
DFMN WAR CHK
TYP SC ENG
SUBMITTED
APPROVED

LIST OF PARTS FOR
CONTROL BOX
PRESSURIZED
STAGE
LIGHTING SYSTEM
SATURN

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
JOHN F. KENNEDY SPACE CENTER
KENNEDY SPACE CENTER, FLORIDA

SIZE ASSY DWG E | PL. LV0220430 | Sheet 2 of 4

KSC FORM 23-109NS (6/65) Print No.

Figure 6-2. Control Box Parts List (Sheet 2 of 4)

PARTS LIST

SIZE ASSY DWG: E | PL LV0220430

1 FIND NMC NO.	2 DESCRIPTION	3 REF DESIG/FED ITEM IDENT NO.	4 DWG SIZE	5 PART/STK NO. DWG. NO.	6 MFRS. PART NO.	7 REQD	8 SEP PART LIST	9 REMARKS OR MFR
24	FUSE, 8 AMP, 110-125 VAC				TYPE 3 AB 314008	1		LITTLEFUSE CO.
25	SWITCH, TOGGLE, DPST	S2		MS35059-22	8822K20	1		CUTLER-HAMMER
26	HANDLE, BOW				910	2		GOE ENGRG. CO.
27	SCREW, MACHINE, FLAT HD			MS35190-253		34		8-32 UNC X .50 LONG
28	SCREW, MACHINE, PAN HD			MS51958-63		5		10-32 UNF .50 LONG
29	SCREW, MACHINE, FLAT HD			MS51960-65		4		10-32 UNF .50 LONG
30	NUT, SELF-LOCKING, NO. 10			MS20365-1032A		3		
31	PLATE, IDENTIFICATION			75M05393-3		1		
32	HOSE ASSEMBLY H1	H1		SHEET 5 OF LV0220430			X	ORDER FROM SHEET 5 AS REQD.
33	END CAP ASSEMBLY			SHEET 5 OF LV0220430			X	ORDER FROM SHEET 5 AS REQD.
34	BREATHER VALVE				790-PRV-0.5-3.0	1		HALKEY ROBERTS PARAMUS, N. J.
35	PLUG, QUICK-CONNECT				LLI-K-4-VAA	1		HANSEN MFG.CO.

NOTES:

REVISIONS				NEXT ASSY	USED ON
SYM	DATE	APPR	DESCRIPTION		

ORIG DATE 6 OCT 66

DFMN WAR | CHK

TYP SO | ENG

SUBMITTED

APPROVED

LIST OF PARTS FOR

CONTROL BOX
PRESSURIZED
STAGE
LIGHTING SYSTEM
SATURN

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
JOHN F. KENNEDY SPACE CENTER
KENNEDY SPACE CENTER, FLORIDA

SIZE ASSY DWG: E | PL LV0220430

Sheet 3 of 4

Print No.

KSC FORM 23-109NS (6/65)

Figure 6-2. Control Box Parts List (Sheet 3 of 4)

PARTS LIST

SIZE ASSY DWG E

PL LV0220430

1 FIND NO.	2 DESCRIPTION	3 REF DESIG/FED ITEM IDENT NO.	4 DWG SIZE	5 PART/STK NO. DWG. NO.	6 MFRS. PART NO.	7 RECD	8 SEP PART LIST	9 REMARKS OR MFR
REF	WIRE, 18 AWG, 19 STRANDS MINIMUM, COLOR-WHITE			MIL-W-16878D TYPE B		AS REQ		

NOTES:

REVISIONS SYM	DATE	APPR	DESCRIPTION	NEXT ASSY	USED ON

ORIG DATE 6 OCT 66

DFTMN WAR CHK

TYP SO ENG

SUBMITTED

APPROVED

LIST OF PARTS FOR

CONTROL BOX
PRESSURIZED
STAGE
LIGHTING SYSTEM
SATURN

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
JOHN F. KENNEDY SPACE CENTER
KENNEDY SPACE CENTER, FLORIDA

SIZE ASSY DWG PL. LV0220430

Sheet 4 of 4

KSC FORM 23-109NS (6/65)

Figure 6-2. Control Box Parts List (Sheet 4 of 4)

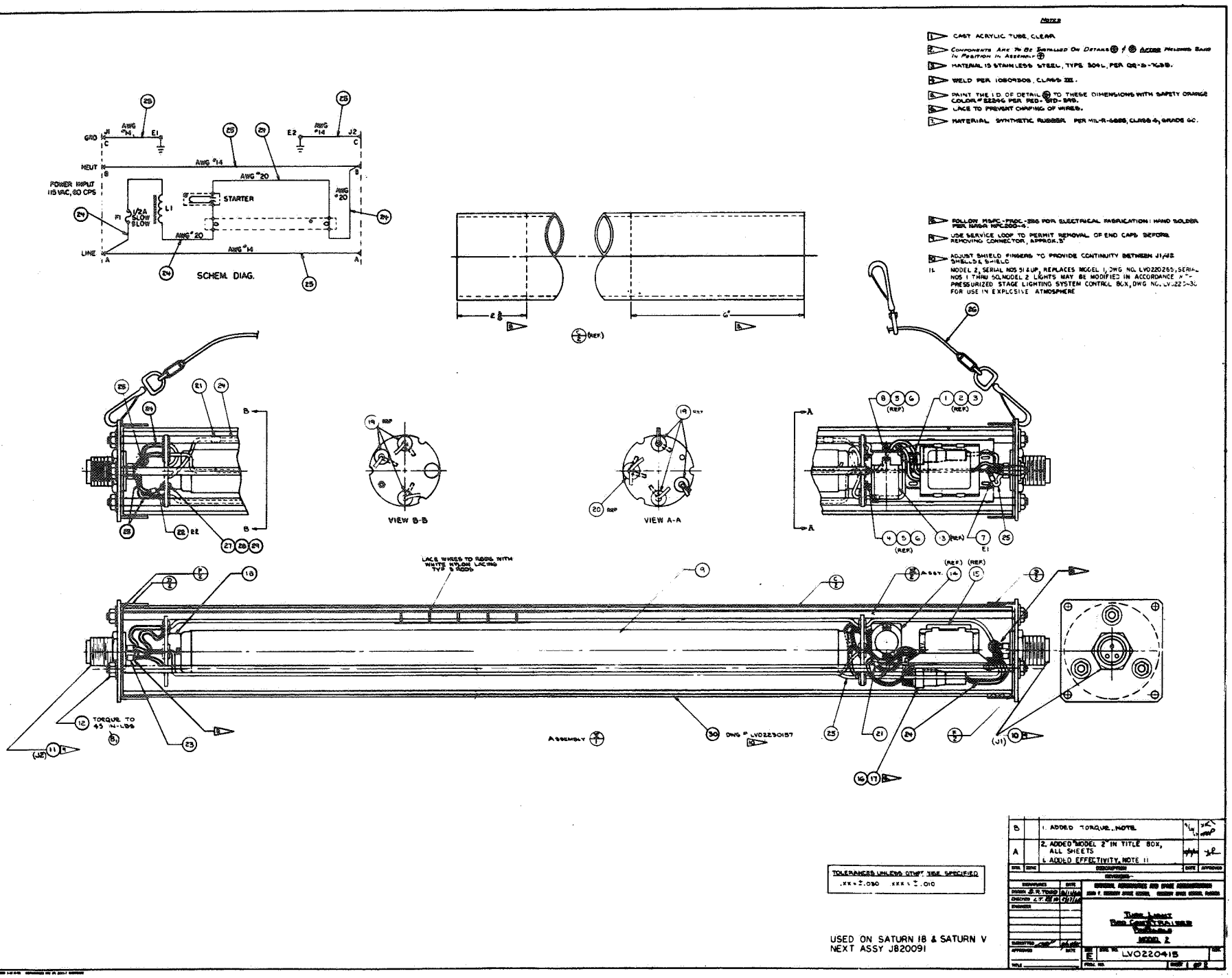


Figure 6-3. Tube Light Assembly (Sheet 1 of 2)

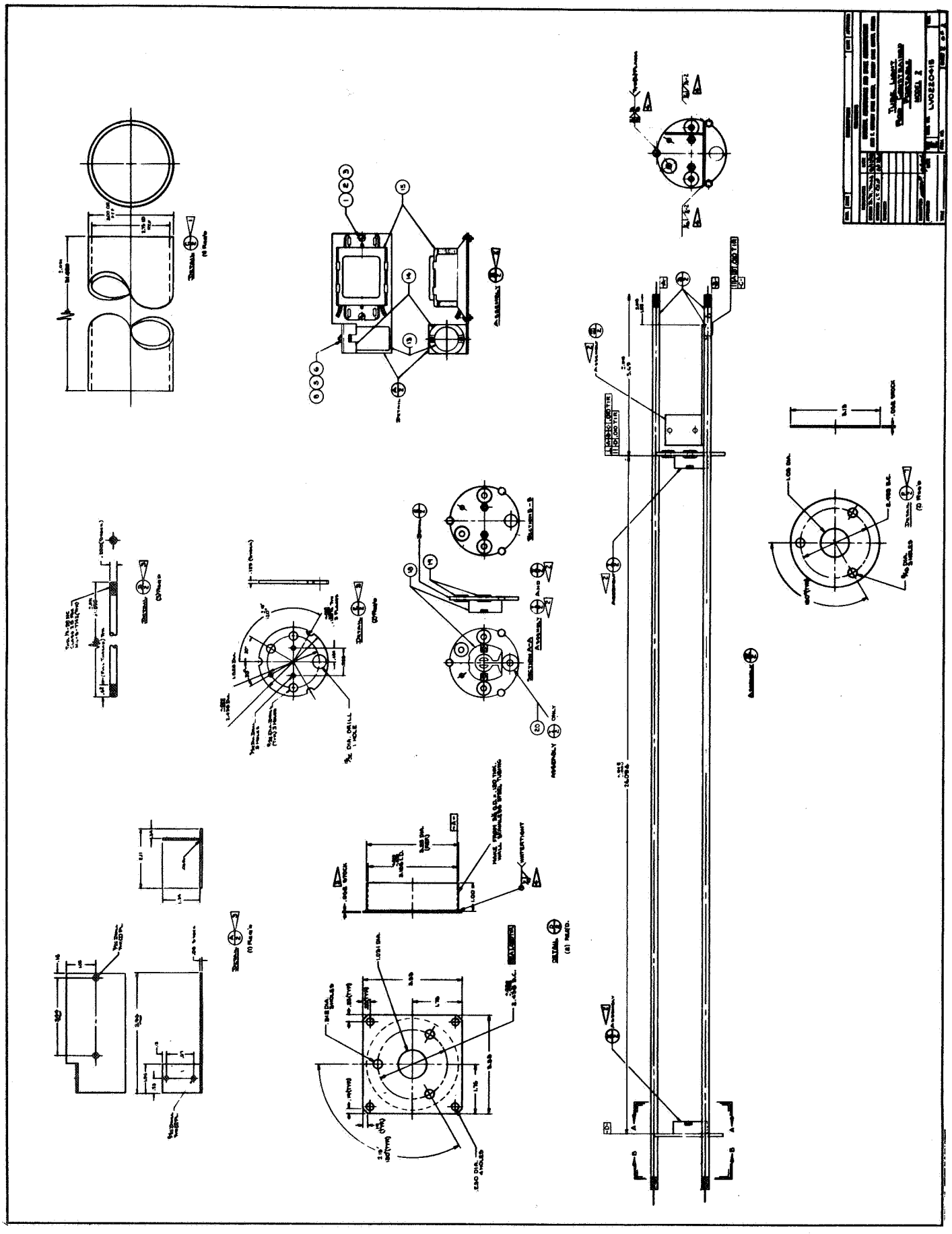


Figure 6-3. Tube Light Assembly (Sheet 2 of 2)

PARTS LIST

SIZE ASSY DWG: PL LV0220415

1 FIND NO.	2 DESCRIPTION	3 REF DESIG/FED ITEM IDENT NO.	4 DWG SIZE	5 PART/STK NO. DWG. NO.	6 MFRS. PART NO.	7 REQD	8 SEP PART LIST	9 REMARKS OR MFR
1	SCREW, MACHINE, RD. HD.			5305-013-2670		2		8-32 UNC X 1/2 LG.
2	WASHER, LOCK			5310-045-3299 MS35338-42		2		NO. 8
3	NUT, HEX			5310-012-0622 MS35649-82		2		8-32 UNC
4	SCREW, MACHINE, RD. HD.					4		4-40 UNC X 11/16 LG
5	WASHER, LOCK			5310-543-2419 MS35338-40		6		NO. 4
6	NUT, HEX			5310-013-4524 MS35649-42		6		4-40 UNC
7	LUG, TERMINAL, INSULATED	E1			35108	1		AMP INC.
8	SCREW, MACHINE, RD. HD.			5305-151-3578		2		#4-40 UNC X 3/8 LG.
9	FLUORESCENT TUBE, 20 WATT 24" LONG X 1.50 DIA.			6240-152-2996	F20T12CW	1		GENERAL ELECTRIC
10	CONNECTOR	J1			10-87317-10P	1		BENDIX CO.
11	CONNECTOR	J2			10-87317-10S	1		BENDIX CO.
12	NUT, 1/4-20				F2520-C	6		BARWOOD MFG. CO.

NOTES:

REVISIONS				NEXT ASSY	USED ON
SYM	DATE	APPR	DESCRIPTION		

ORIG DATE: 8/11/66
DFMN: WAS CHK: [illegible]
TYP: DWG:
SUBMITTED: [illegible] 8/24/66
APPROVED:

LIST OF PARTS FOR: TUBE LIGHT ROD CONSTRAINED PORTABLE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
JOHN F. KENNEDY SPACE CENTER
KENNEDY SPACE CENTER, FLORIDA

SIZE ASSY DWG: PL LV0220415
Sheet 1 of 3

KSC FORM 23-109NS (6/68)
Print No.

Figure 6-4. Tube Light Assembly Parts List (Sheet 1 of 3)

PARTS LIST

SIZE ASSY DWG: PL LV0220415

1 FIND ING NO.	2 DESCRIPTION	3 REF DESIG/FED ITEM IDENT NO.	4 DWG SIZE	5 PART/STK NO. DWG. NO.	6 MFRS. PART NO.	7 REQD	8 SEP PART LIST	9 REMARKS OR MFR
13	FLUORSCENT TUBE STARTER				FS-2	1		HUB ELEC CO.
14	FLUORSCENT LAMP STARTER SOCKET				95 X 299	1		GENERAL ELECTRIC
15	BALLAST 14-15-20 WATT	L1				1		UNIVERSAL MFG.
16	FUSE, 1/2AMP, SLO BLO	F1			MDL-1/2	1		BUSSMAN CO
17	FUSE HOLDER	XF1			HHJ-A	1		BUSSMAN CO.
18	MED BI-PIN LAMPHOLDER (BUTT-ON-TYPE)(WHITE UREA)				503 X 60	2		GENERAL ELECTRIC
19	GROMMET				91110	6		WHOLESALE RADIO PARTS
20	GROMMET				91103	1		WHOLE SALE RADIO PARTS
21	WIRE SPLICE, INSULATED				320559	4		AMP INC.
22	LUG, TERMINAL, INSULATED	E2			35148	1		AMP INC.
23	TUBING, HEAT SHRINKABLE	MSFC-SPEC 276			276-11WD .112 DIA	AS REQ'D		
24	20 AWG WIRE, 19 STRANDED COLOR-WHITE	MIL-W-16878 TYPE B				AS REQ'D		

NOTES:

REVISIONS SYM	DATE	APPR	DESCRIPTION	NEXT ASSY	USED ON

ORIG DATE 8/11/66
DFMN AS CHK LPB
TYP ENG
SUBMITTED
APPROVED

LIST OF PARTS FOR
TUBE LIGHT
ROD CONSTRAINED
PORTABLE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
JOHN F. KENNEDY SPACE CENTER
KENNEDY SPACE CENTER, FLORIDA

SIZE ASSY DWG: PL. LV0220415
Sheet 2 of 3

KSC FORM 23-109NS (6/65) AFSC - Patrick AFB. Fla. Print No.

Figure 6-4. Tube Light Assembly Parts List (Sheet 2 of 3)

PARTS LIST

SIZE ASSY DWG: PL LV022.0415

1 FIND NMG NO.	2 DESCRIPTION	3 REF DESIG/FED ITEM IDENT NO.	4 DWG SIZE	5 PART/STK NO. DWG. NO.	6 MFRS. PART NO.	7 REQD	8 SEP PART LIST	9 REMARKS OR MFR
25	14 AWG WIRE, 19 STRANDED COLOR - WHITE	MIL-W-5086 TYPE 2				AS REQD		
26	LANYARD ASS'Y.		D	LV0223-0164-2		2		
27	PAN HD. SCREW			5305-984-4984 MS35206-227		1		#6-32 x 5/16 LG.
28	HEX NUT			5310-013-4530 MS35649-62		1		#6-32
29	LOCKWASHER			5310-045-4007 MS35338-41		1		#6
30	SHIELD, R.F.I.		C	LV02230157		1		

NOTES:

REVISIONS				NEXT ASSY	USED ON
SYM	DATE	APPR	DESCRIPTION		

ORIG DATE 8/11/66
DRWN WAS CHK JTR
TYP ENG
SUBMITTED
APPROVED

LIST OF PARTS FOR
TUBE LIGHT
ROD CONSTRAINED
PORTABLE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
JOHN F. KENNEDY SPACE CENTER
KENNEDY SPACE CENTER, FLORIDA

SIZE ASSY DWG: PL LV022041B
Sheet 3 of 3

KSC FORM 23-109NS (6/65) AFSC - Patrick AFB. Fla. Print No.

Figure 6-4. Tube Light Assembly Parts List (Sheet 3 of 3)

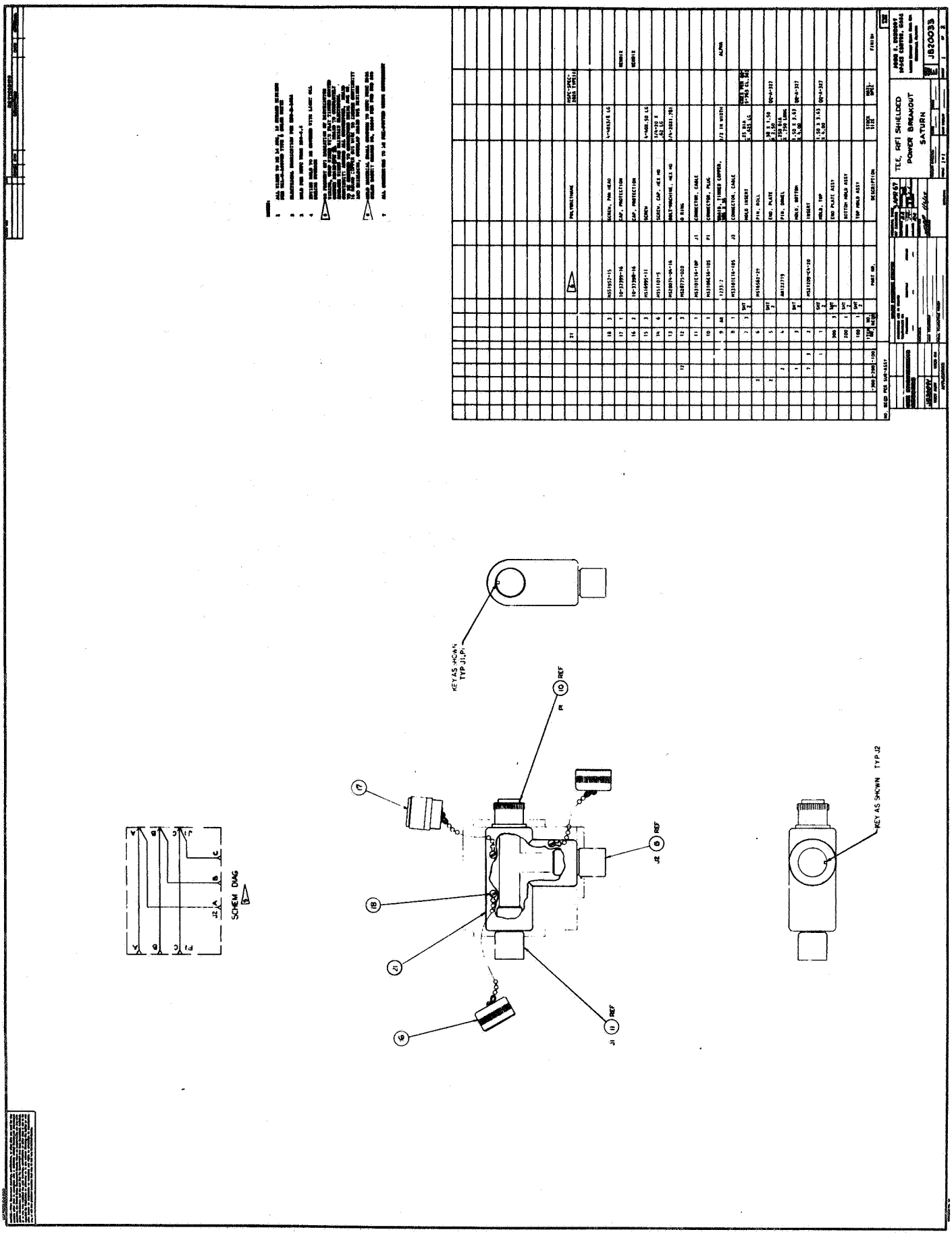


Figure 6-5. Molded Tee Adapter (Sheet 1 of 2)

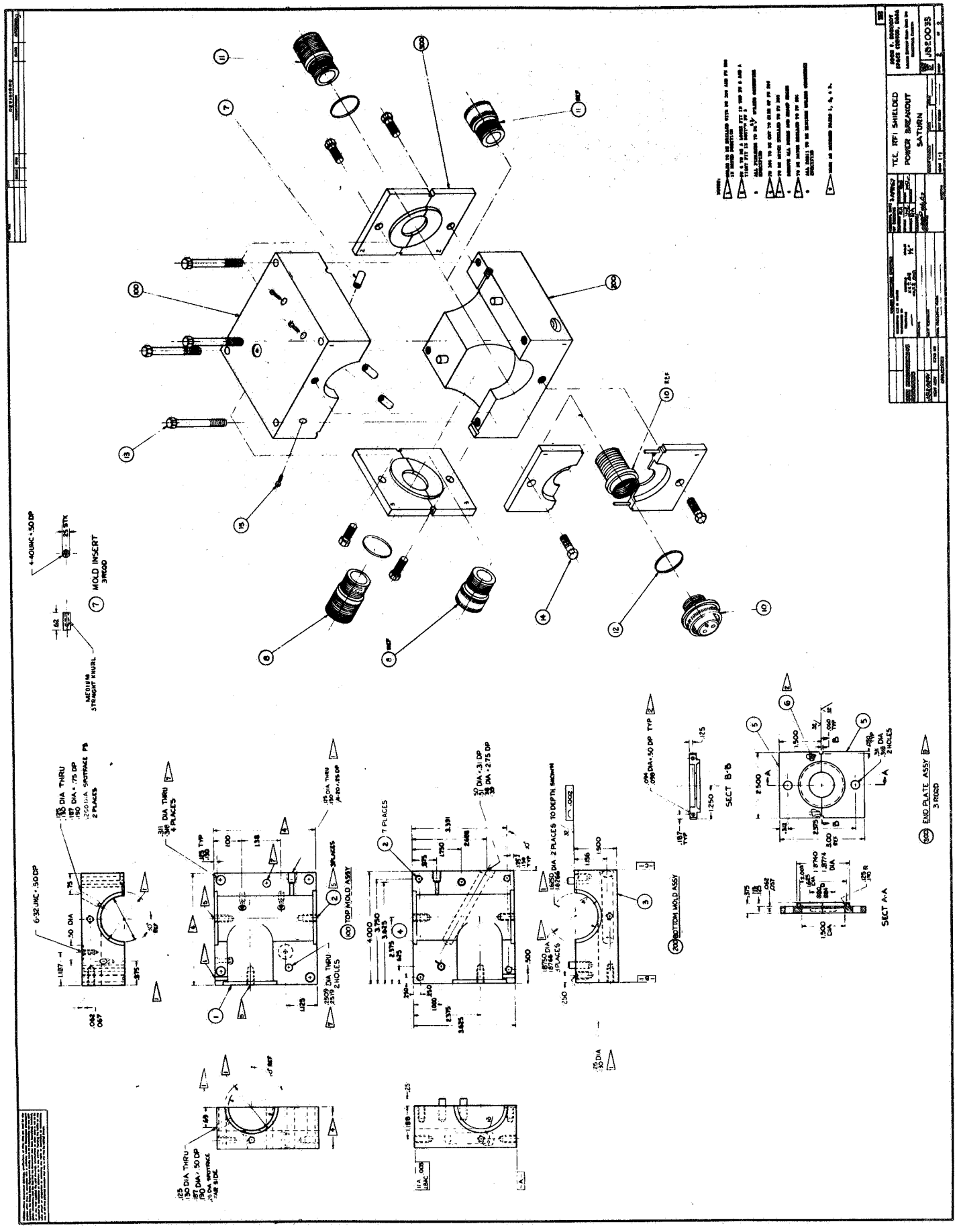


Figure 6-5. Molded Tee Adapter (Sheet 2 of 2)

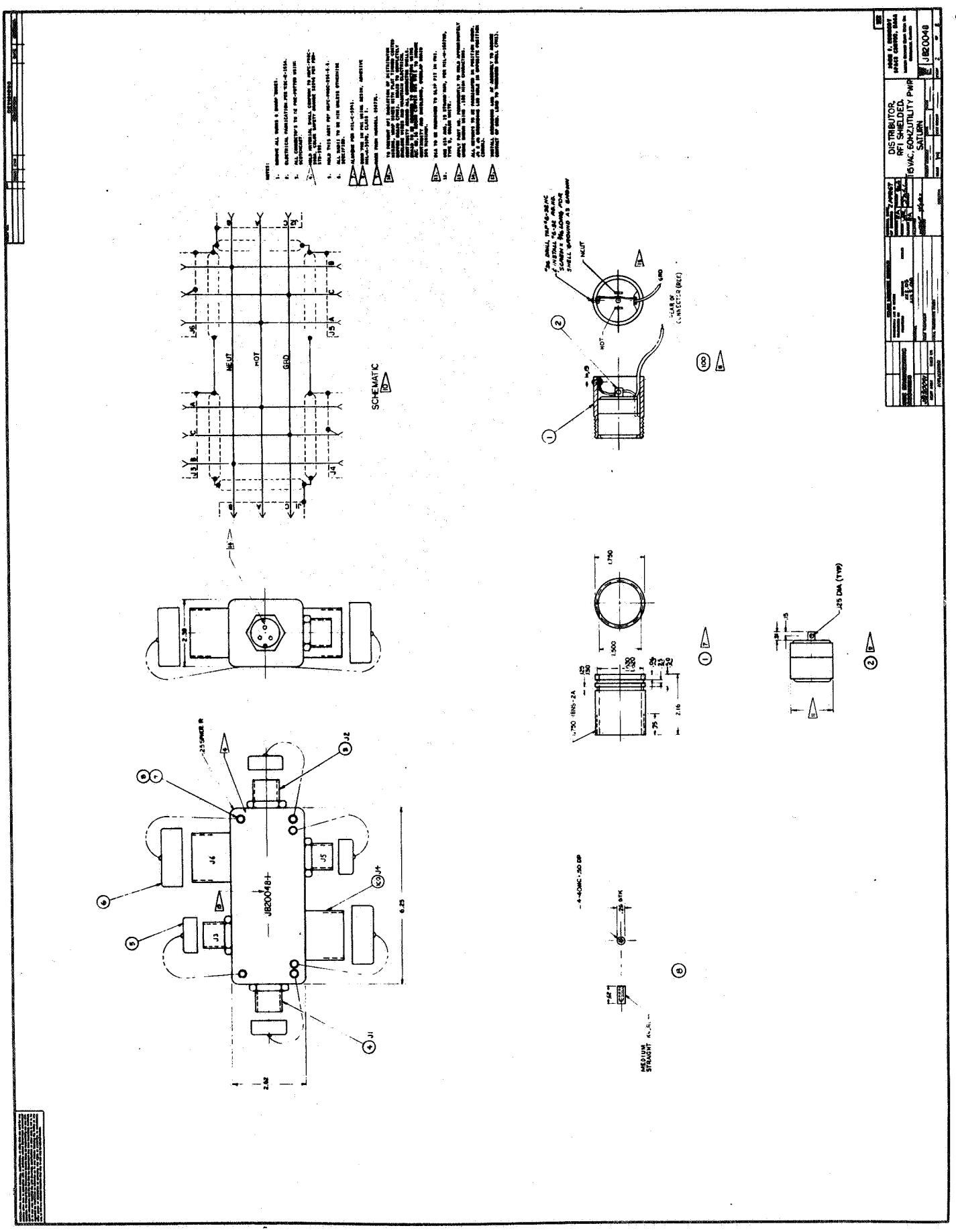
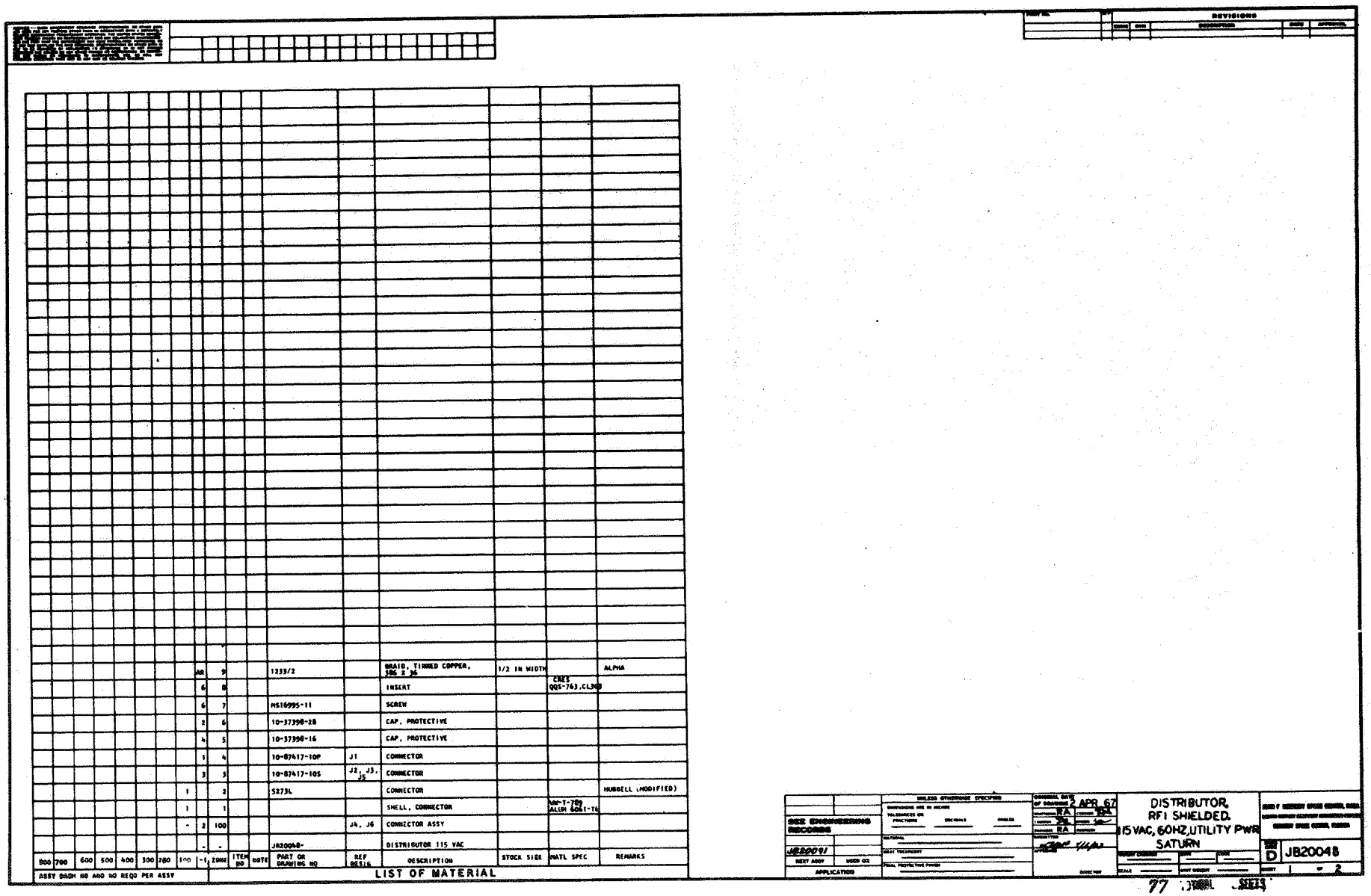


Figure 6-6. Molded Distributor (Sheet 1 of 2)



ASSY DASH NO AND NO REQD PER ASSY								ITEM NO	NOTE	PART OR DRAWING NO	REF DESIG	DESCRIPTION	STOCK SIZE	MATL SPEC	REMARKS
							-1	ZONE							
							-	2	100			DISTRIBUTOR 115 VAC			
							-	-	-	JB20048-	J4, J6	CONNECTOR ASSY			
												SHELL, CONNECTOR		MIL-T-7789 ALUM 6061-T6	
							1		2	5273L		CONNECTOR			HUBBELL (MODIFIED)
								3	3	10-87417-10S	J2, J3, J5	CONNECTOR			
								1	4	10-87417-10P	J1	CONNECTOR			
								4	5	10-37398-16		CAP, PROTECTIVE			
								2	6	10-37398-28		CAP, PROTECTIVE			
								6	7	MS16995-11		SCREW			
								6	8			INSERT		CRES QQS-763,CL304	
								AR	9	1233/2		BRAID, TINNED COPPER, .186 X .36	1/2 IN WIDTH		ALPHA

LIST OF MATERIAL

GSE ENGINEERING RECORDS

JB20091

NEXT ASSY | USED ON

APPLICATION

GENERAL DATE OF DRAWING 2 APR 67

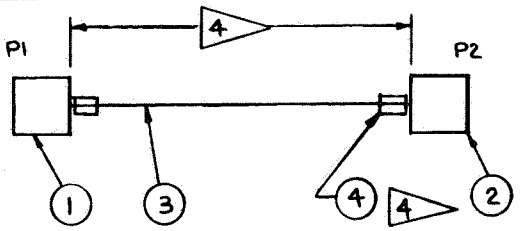
DISTRIBUTOR, RFI SHIELDED, 115 VAC, 60HZ, UTILITY PWR SATURN

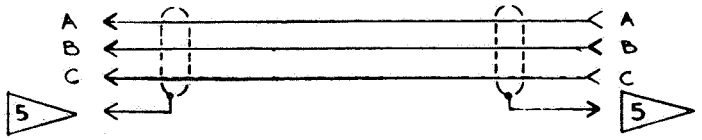
SIZE D | JB20048

77 [illegible] SHEETS

Figure 6-6. Molded Distributor (Sheet 2 of 2)

PART No.	M F	REVISIONS				
		ZONE	SYM	DESCRIPTION	DATE	APPROVAL





NOTES:

1. ELECTRICAL FABRICATION PER MSFC-PROC-256
2. HAND SOLDER PER NPC-200-4
3. POT PER MSFC-PROC-256
4. DASH NUMBER AFTER ASSEMBLY NUMBER INDICATES LENGTH OF CABLE IN FEET, TOLERANCE ±4 INCHES PER 10 FEET OF CABLE E.G. LV0220422-20 INDICATES CABLE 20 FOOT LONG, ±8 INCHES. STAMP PART NUMBER AND DASH NUMBER ON CABLE MARKER WITH NO 1/8 HIGH LETTERS, ONE FOOT MAXIMUM DISTANCE BETWEEN MARKERS AND APPROPRIATE CONNECTOR
5. OVERALL SHIELD TO HAVE 360° CONTACT TIED TO SHELL PER SCHEMATIC.
6. CABLE TO BE 3 CONDUCTOR #12 AWG PVC INSULATED WIRE, 65/30 STRANDS PER MIL-W-76B, WITH EXTRA FLEXIBLE OVERALL SHIELD CAPABLE OF 100 DB ATTENUATION TO BROADBAND AND PULSED CW RADIATED INTERFERENCE .1 TO 1000 MEGACYCLES. TO BE COVERED WITH NEOPRENE JACKET.

NO REQ'D	FIND NO	PART DESCRIPTION
2	4	CABLE MARKER, THOMAS & BETTS
1	3	CABLE SHIELDED, SEE NOTE 6
1	2	CONNECTOR PLUG, MS3106E-16-10S, BENDIX CO.
1	1	CONNECTOR PLUG, MS3106E-16-10P, BENDIX CO.

LIST OF MATERIAL

SEE ENGINEERING RECORDS

	LC 34 & 37
JB20091	LC-39
NEXT ASSY	USED ON

APPLICATION

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON FRACTIONS — DECIMALS — ANGLES —
MATERIAL —
HEAT TREATMENT —
FINAL PROTECTIVE FINISH —

ORIGINAL DATE OF DRAWING 29 AUG 66
DRAFTSMAN LTR — CHECKER J. BROWN
CHECKER — STRESS
ENGINEER WMB — ENGINEER
SUBMITTED
APPROVED 8/24/66
DIRECTOR

CABLE ASSEMBLY-INTERNAL LIGHTING SATURN

WEIGHT CHECKER — DATE — CODE —
SCALE NONE — UNIT WEIGHT —

JOHN F. KENNEDY SPACE CENTER, NASA
LAUNCH SUPPORT EQUIPMENT ENGINEERING DIVISION
KENNEDY SPACE CENTER, FLORIDA

DWG SIZE B — LV0220422

SHEET 1 OF 1

Figure 6-7. Internal Lighting Cable Assembly

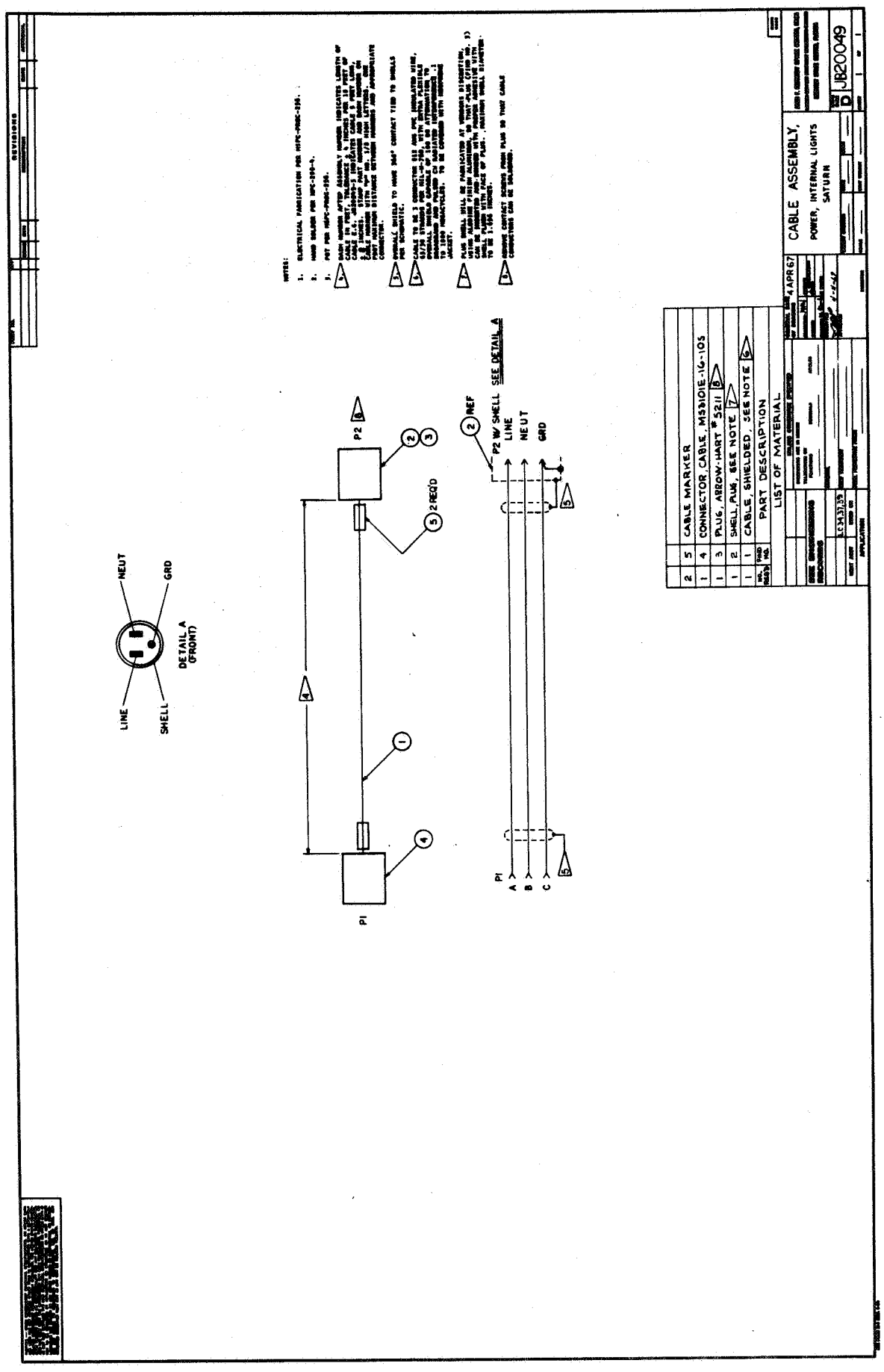
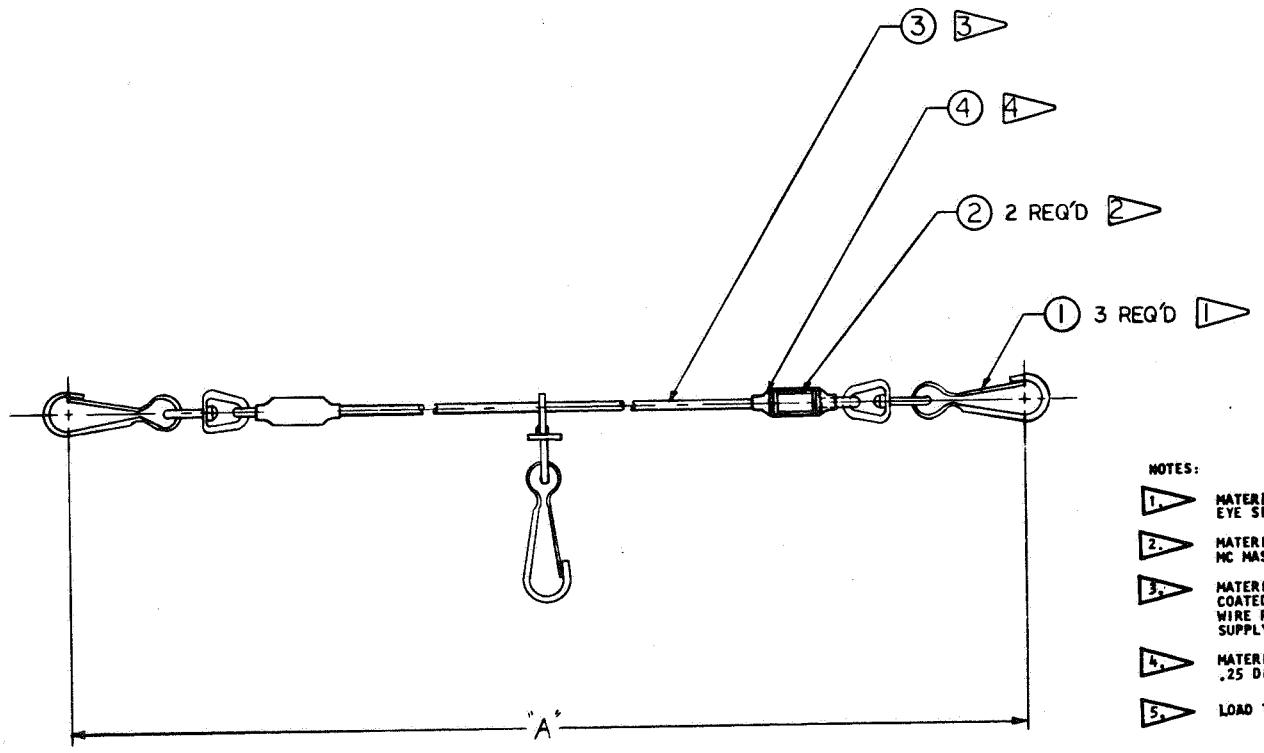


Figure 6-8. Internal Lights Cable Assembly



LANYARD ASSEMBLY 5

NOTES:

1. MATERIAL: SNAP, SWIVEL EYE, STEEL, NICKLE PLATED, EYE SIZE 1/4", COVERT MFG. CO. PART NO. 734.
2. MATERIAL: SPLICING SLEEVE FOR .094 DIA WIRE ROPE, MC MASTER-CARR SUPPLY CO. PART NO. 3506X13 OR EQUAL.
3. MATERIAL: AIRCRAFT CABLE, GALVANIZED STEEL, NYLON COATED, INNER CABLE CONSTRUCTION 7 X 7, .062 DIA WIRE ROPE NYLON COATED TO .094 DIA, MC MASTER-CARR SUPPLY CO. PART NO. 3455I OR EQUAL.
4. MATERIAL: TUBING, HEAT SHRINKABLE, PART NO. 276-21W-I.D. .25 DIA PER MSFC-SPEC-276.
5. LOAD TEST AT 50 LBS.

LANYARD LENGTH TABULATION		
ASSY NO	DESCRIPTION	DIMENSION "A"
1	LANYARD	18"
2	"	33"
3	"	48"
4	"	72"

SYM.	ZONE	REVISIONS: DESCRIPTION	DATE	APPROVED
C		"C" CLAMP, SNAP WAS ANCHOR PN 437 [illegible] WN WITH CHANGES; REMOVED		

SIGNATURES	DATE
DRAWN I.F. [illegible]	5/6/62
CHECKED [illegible]	
ENGINEER J. [illegible]	4/9/62
DESIGNER [illegible]	
SUBMITTED [illegible]	4-9-62
APPROVED	

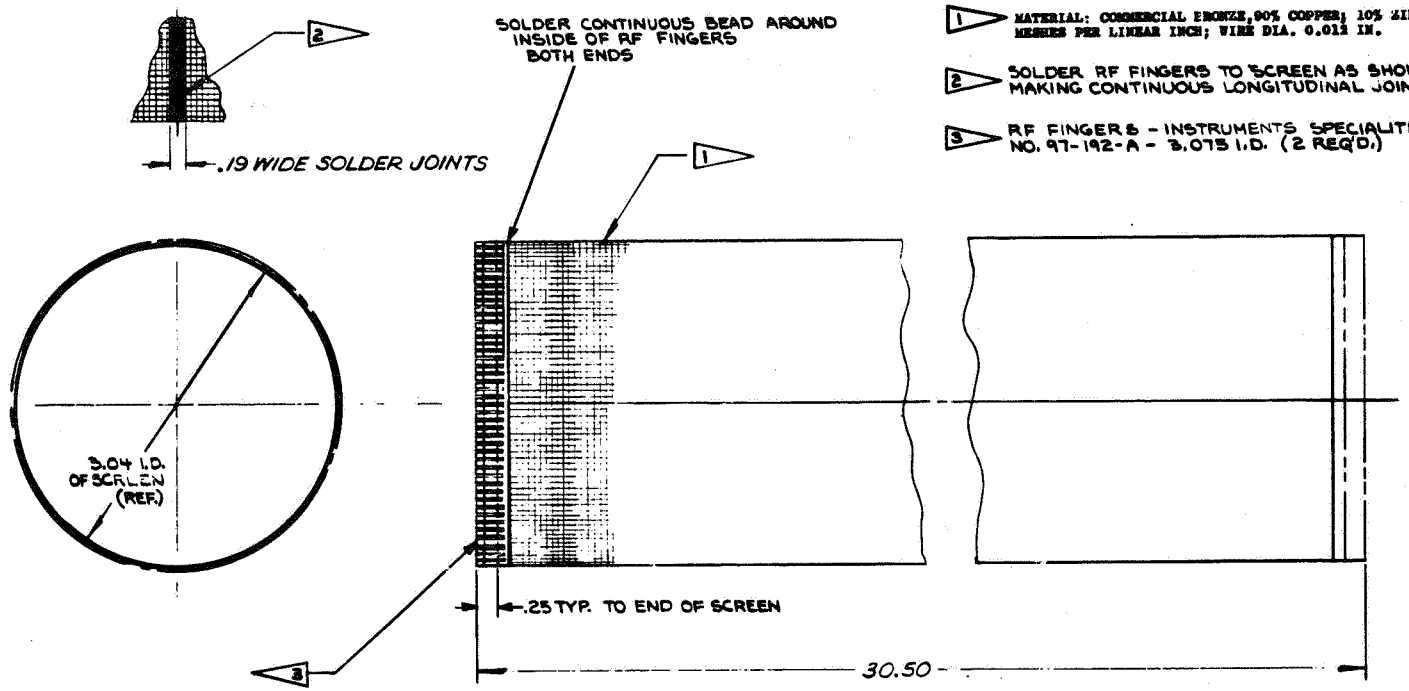
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
JOHN F. KENNEDY SPACE CENTER COCOA BEACH, FLA.

LANYARD ASSEMBLY SATURN

SIZE C | DWG. NO. LV0223-0164

PROJ. NO. | SHEET 1 OF 1

Figure 6-9. Lanyard Assembly



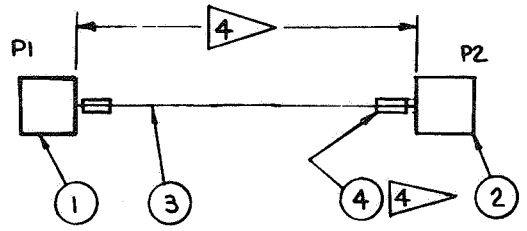
NEXT ASSEMBLY LV0220415
NEXT ASSEMBLY LV0220265

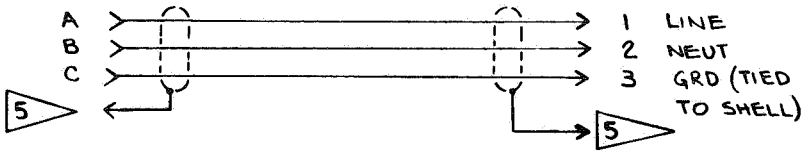
SYM.	ZONE	DESCRIPTION	DATE	APPROVED
		REVISIONS		

DRAWN W. ROGERS	11-2	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION JOHN F. KENNEDY SPACE CENTER, NASA KENNEDY SPACE CENTER, FLORIDA
CHECKED	4-10-62	SHIELD, R.F.I.
ENGINEER W. Rogers	11-4-62	
SUBMITTED		SIZE C DWG. NO. LV02230157
APPROVED		SCALE 1=1 SHEET 1 OF 1

Figure 6-10. RFI Shield

PART No.	M P	REVISIONS				
		ZONE	SYM	DESCRIPTION	DATE	APPROVAL





NOTES:

1. ELECTRICAL FABRICATION PER MSFC-PROC-256.
2. HAND SOLDER PER NPC-200-4
3. POT PER MSFC-PROC-256
4. DASH NUMBER AFTER ASSEMBLY NUMBER INDICATES LENGTH OF CABLE IN FEET, TOLERANCE ±4 INCHES PER 10 FEET OF CABLE E.G. LVQ220423-20 INDICATES CABLE 20 FOOT LONG, ±8 INCHES. STAMP PART NUMBER AND DASH NUMBER ON CABLE MARKER WITH 'P' NO. 1/8 HIGH LETTERS. ONE FOOT MAXIMUM DISTANCE BETWEEN MARKERS. AND APPROPRIATE CONNECTOR
5. OVERALL SHIELD TO HAVE 360° CONTACT TIED TO SHELL PER SCHEMATIC.
6. CABLE TO BE 3 CONDUCTOR #12 AWG PVC INSULATED WIRE, 65/30 STRANDS PER MIL-W-76B, WITH EXTRA FLEXIBLE OVERALL SHIELD CAPABLE OF 100 DB ATTENUATION TO BROADBAND AND PULSED CW RADIATED INTERFERENCE .1 TO 1000 MEGACYCLES. TO BE COVERED WITH NEOPRENE JACKET.

NO REQD	FIND NO	PART DESCRIPTION
2	4	CABLE MARKER, THOMAS & BETTS
1	3	CABLE SHIELDED, SEE NOTE 6
1	2	CONNECTOR PLUG, APJ3363,30A., CROUSE-HINDS
1	1	CONNECTOR, CABLE, MS3101E-16-10S, BENDIX CO.

LIST OF MATERIAL

SEE ENGINEERING RECORDS	
	LC 34 & 37
JB20091	LC-39
NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ON FRACTIONS — DECIMALS — ANGLES —
MATERIAL —
HEAT TREATMENT —
FINAL PROTECTIVE FINISH —

ORIGINAL DATE OF DRAWING 29 AUG 66
DRAFTSMAN LTC — CHECKER J. NAPOLEONARDS — STRESS — ENGINEER — SUBMITTED — APPROVED — DIRECTOR

CABLE ASSEMBLY-POWER-INTERNAL LIGHTS SATURN

WEIGHT CHECKER — DATE — CODE —
SCALE NONE — UNIT WEIGHT —

JOHN F. KENNEDY SPACE CENTER, NASA
LAUNCH SUPPORT EQUIPMENT ENGINEERING BRANCH
KENNEDY SPACE CENTER, FLORIDA

CNTR CODE

DWG SIZE B — LVO220423

SHEET 1 OF 1

KSC FORM 21 4 (REV 9 65)

Figure 6-11. Internal Power Cable Assembly

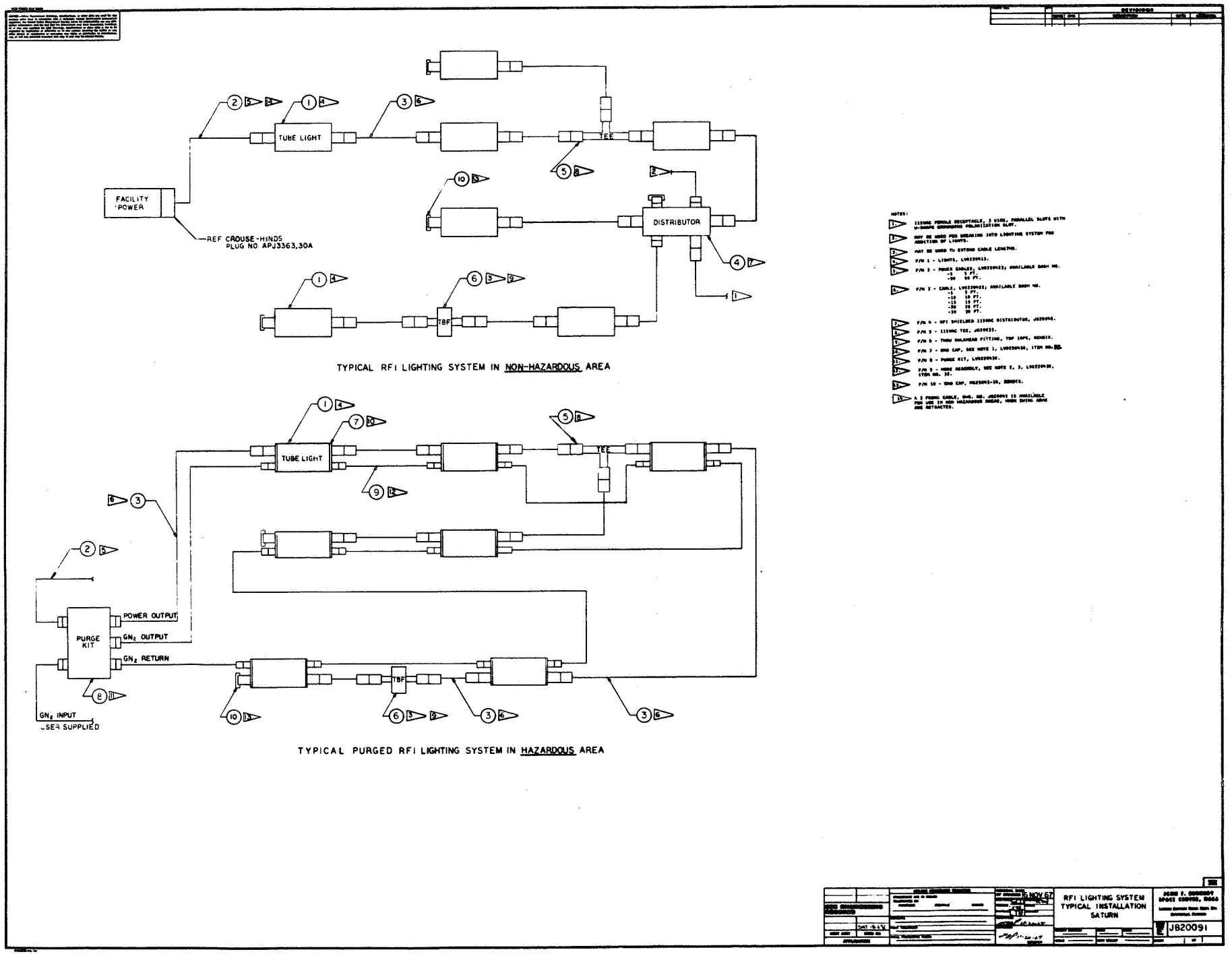


Figure 6-12. RFI Lighting System Typical Installation

APPROVAL

TM-542

OPERATIONS AND MAINTENANCE MANUAL UPRATED SATURN I AND SATURN V VEHICLE STAGE PRESSURIZED LIGHTING SYSTEM

ORIGINATOR:

G. A. Phlieger Jr.
Electrical Systems Branch

APPROVALS:

R. E. Lealman
Chief, Electrical Guidance and Control Systems Division

W. O. Chandler
Chief, Electrical Systems Branch

J. R. Atkins
Chief, Safety Office

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IS-SAF-3	(3)
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